Appendix F

EPA Pattern Failure Descriptions

and I/M Failure Rate Data

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Ann Arbor, Michigan 48105

I/M PATTERN FAILURE SUMMARY

NUMBER: 85-01
PREPARED: 11/03/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: Chrysler

VEHICLE DESCRIPTION

Engine: 84-85 Chry 2.2 L ETBI

Engine Family	Fed Cal	MY	Affected Models
ECR2.2V5HCF1	F	84	E Class/New Yorker/600/ Laser/Daytona
ECR2.2V5HDL0	C	84	E Class/New Yorker/600/ Laser/Daytona
FCR2.2V5HCF2	F	85	New Yorker/Caravelle/ LeBaron/Laser/Aries/ 600/Daytona/Reliant
FCR2.2V5HDL1	C	85	New Yorker/Caravelle/ LeBaron/Laser/Aries/ 600/Daytona/Reliant

Notes: Affects automatic transmission non-turbo version only. 1985 MY vehicles produced after early November 1984 should not show the pattern failure due to a production running change.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, restart-idle, restart-2500, two speed, & loaded	idle-N,	CO	20%

Cause: vehicle operates open loop with enriched fuel metering during idle-neutral operation.

Subpart W Factors: none yet identified.

DISPOSITION

Field Fix: Chrysler TSB's 25-01-85 and 25-05-85 outline procedure for diagnosis and replacement of logic module.

Alternative Test Procedure: I/M programs may elect to test the affected vehicles with idle-drive in place of idle-neutral

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-02
PREPARED: 11/03/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: Chrysler

VEHICLE DESCRIPTION

Engine: 84-85 Chry 2.6 L . 2 bbl

Engine Family	Fed Cal	MY	Affected Models
ECR2.6T2AAC8	F	84	Caravan/Ram Van/Voyager
ECR2.6T2BBK1	C	84	Caravan/Ram Van/Voyager
FCR2.6T2BBK2	C	85	Caravan/Ram Van/Voyager

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, restart-idle, restart-2500 & two speed	idle-N, 2500 rpm	CO	?

Cause: excessive evap system purge.

Subpart W Factors: none yet identified.

DISPOSITION

Field Fix: Chrysler TSB 25-07-85 describes installation of an altitude emissions package for the affected vehicles.

Alternative Test Procedure: none identified.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-03
PREPARED: 11/18/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: Ford

VEHICLE DESCRIPTION

Engine: all 81-86 Ford engines

Engine Family	Fed Cal	MY	Affected Models

This summary applies to all 1981-1986 model year Ford engine families and models.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, two speed	idle-N	CO, CO + HC	var'ble

Cause: vehicles divert secondary air to atmosphere after extended idle, inhibiting exhaust aftertreatment of CO and HC. Diversion is controlled by mechanical or electronic timer. Idle diversion times range from 15 seconds to 3.5 minutes, depending on calibration and duration of last period of off-idle operation.

Subpart W Factors: failure rates for some calibrations will increase dramatically if approved sampling and test sequence instructions are not followed.

DISPOSITION

Field Fix: none.

Alternative Test Procedures: EPA's 12 June 1984 rulemaking states that the only approved procedures for testing 1981 and later Fords at low altitude are the restart-idle test, the restart-2500-idle test, and the loaded test. The effect of either the restart or loaded testing is to reset the diversion timer and prevent secondary air diversion. At high altitude, Fords may be tested with any of the six EPA-approved procedures (however, see also I/M Pattern Case Summary 85-04 or replacement).

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-04
PREPARED: 11/18/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: Ford

VEHICLE DESCRIPTION

Engine: 81-85 Ford 5.0 L

Engine Family	Fed Cal	MY	Affected Models

Engine families and affected models are being confirmed.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, two-speed	idle-N	CO CO + HC	var'ble

Cause: under investigation. Air diversion timers may not be reset by loaded testing or off-idle, no-load preconditioning (see also I/M Pattern Case Summary 85-03 or replacement).

Subpart W Factors: see Cause.

DISPOSITION

Field Fix: none.

Alternative Test Procedure: vehicles will probably pass either of the EPA-approved restart test procedures.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-05
PREPARED: 11/03/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: Ford

VEHICLE DESCRIPTION

Engine: 84 Ford 2.8 L 2 bbl

Engine Family	Fed Cal	MY	Affected Models
EFM2.8T2HKGX		84	Bronco II
EFM2.8T2HCG1		84	Bronco II

Note: Only a portion of the production in the indicated families affected.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, restart-idle, restart-2500, two speed	idle-N	CO	?

Cause: vehicles contain timer that causes diversion of secondary air to atmosphere after extended idle; timer is not reset unless vehicle is left off for at least 10 seconds before restarting.

DISPOSITION

Field Fix: none identified.

Alternative Test Procedures: vehicles will pass standard restart-idle and restart-2500 procedures if the keyoff time exceeds 10 seconds.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-06
PREPARED: 11/03/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: Ford

VEHICLE DESCRIPTION

Engine: ~~84-85~~ 85-86 Ford 2.3 L EPFI

Engine Family	Fed Cal	MY	Affected Models
FFM2.3T5FAG7		85	Ranger PU 2wd & 4wd
GFM2.3T5FAG8		86	Ranger PU 2wd & 4wd/ Aerostar

Notes: Automatic transmission version may fail at lower rates and may not present a pattern problem. Other models included in family FFM2.3T5FAG7 but not listed above do not display the pattern failure.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, restart-idle, restart-2500, two speed	idle-N	HC	25%
loaded	loaded	?	?
	idle-N	?	?

Cause: ECM calibration governing engine timing and/or fuel metering below 900 rpm

Subpart W Factors: failure rates may be adversely affected by use of restart and/or 2500 rpm preconditioning.

DISPOSITION

Field Fix: Ford TSB 85-16 outlines procedure for increasing curb idle speed.

Alternative Test Procedures: none approved by EPA.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-07
PREPARED: 11/03/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: General Motors

VEHICLE DESCRIPTION

Engine: 81 GM 1.6 L 2 bbl

Engine Family	Fed Cal	MY	Affected Models
11W2TNQZ		81	Chevette/T1000

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, restart-idle, restart-2500, two speed, loaded	idle-N	CO	17%

Probable Causes: (1) corrosion of pulse air tubing and lock-up of air management solenoid valve; (2) rich air/fuel mixture following no-load off-idle operation, emissions slowly decrease as mix leans out at idle.

Subpart W Factors: improperly shortened idle-N sampling interval following 2500 rpm preconditioning will probably increase failure rate.

Notes: this family was recalled on 30 August 1985 for repairs to the pulse air system.

DISPOSITION

Field Fix: field reports of successful I/M retests following the recall repair; not yet confirmed by EPA or manufacturer.

Alternative Test Procedures: none approved by EPA.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-08
PREPARED: 11/03/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: General Motors

VEHICLE DESCRIPTION

Engine: 83 GM 2.5 L ETBI

Engine Family	Fed Cal	MY	Affected Models
D2G2.5V5TPG6		83	Celebrity/Camaro/6000/ Phoenix/Firebird/ Cutlass Ciera/Omega/ Century/Skylark

Notes: see also I/M Pattern Case Summary 85-09 or replacement for different pattern case involving 84-85 GM 2.5 L (Pontiac Fiero).

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, two speed & loaded	idle-N	CO	7%

Cause: not yet identified.

Subpart W Factors: none yet identified.

Notes: no data currently available on restart tests.

DISPOSITION

Field Fix: none yet identified.

Alternative Test Procedures: none yet identified.

Notes: programs are advised to provide vehicle owners with temporary waivers with no repair cost obligation pending analysis of the problem by EPA and the manufacturer.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-09
PREPARED: 11/03/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: General Motors

VEHICLE DESCRIPTION

Engine: 84-85 GM 2.5 L ETBI

Engine Family	Fed Cal	MY	Affected Models
E2G2.5V5TPG7		84	Fiero
F2G2.5V5TPG8		85	Fiero

Notes: Other models in these engine families not affected. See also I/M Pattern Case Summary 85-08 or replacement for different pattern case involving 83 GM 2.5 L.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, two speed, loaded, restart-idle, restart-2500	idle-N	HC	7%

Cause: none yet identified. May be related to timing advance at idle.

Subpart W Factors: none yet identified.

DISPOSITION

Field Fix: none yet identified.

Alternative Test Procedures: none approved. EPA has reports of affected vehicles being tested with accessories on (to load the engine), and with the ECM grounded to place the engine in diagnostic mode. These procedures are not EPA-approved.

Notes: programs are advised to provide vehicle owners with temporary waivers with no repair cost obligation pending analysis of the problem by EPA and the manufacturer.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 86-02
PREPARED: 10/16/86
REPLACES: 85-09
11/03/85
PAGE: 1 of 1

Note: All lines with significant revisions from previous versions are marked with "#".

MANUFACTURER: General Motors

VEHICLE DESCRIPTION

Engine: 84 GM 2.5 L ETBI

	Engine Family	Fed Cal	MY	Affected Models
#	E2G2.5V5TPG7		84	Fiero/6000/Firebird/ Phoenix/Celebrity/Camaro/ Citation/Skylark/Omega

Notes: Automatic transmission models do not exhibit the pattern. See also I/M Pattern Failure Summary ~~86-02~~ 85-08 of replacement for a different pattern failure involving 83 GM 2.5 L.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, two speed, loaded, restart-idle, restart-2500	idle-N	HC	7%

Cause: Related to timing advance at idle.

Subpart W Factors: none yet identified.

DISPOSITION

Field Fix: Pontiac TSB 84-6-90, Chevrolet TSB 84-264-6E, Buick TSB 86-6E-10, and Oldsmobile Service Guild Product Training Manual-May 1986-page 60 outline procedures for diagnosis and replacement of PROM.

Alternative Test Procedures: none approved. EPA has reports of affected vehicles being tested with accessories on (to load the engine), and with the ECM grounded to place the engine in diagnostic mode. These procedures are not EPA-approved.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-14
PREPARED: 12/17/85
REPLACES: 85/10
11/03/85
PAGE: 1 of 2

Note: All sections of this summary contain significant changes from the corresponding sections in the previous version.

MANUFACTURER: General Motors

VEHICLE DESCRIPTION

Engines:
84-86 GM 3.8 L EPFI Turbo
86 GM 3.8 L EPFI
85-86 GM 3.0 L EPFI

Engine Family	Fed Cal	MY	Affected Models
E4G3.8V9XEB6		84	Regal/Riviera/Riviera Convertible
F4G3.8V9XEB7		85	Regal/Riviera/Riviera Convertible
F4G3.8V8XEB3		85	Somerset Regal/Grand Am/ Calais
G4G3.8V9XAB8		86	Regal
G4G3.8V8XAB4		86	Somerset Regal/Grand Am/ Calais/Century/LeSabre/ Cutlass Ciera/Delta 88 Royale/Electra*/Riviera*/ Toronado*/98 Regency*

Notes: All affected vehicles have Computer Controlled Combustion Ignition (C^3I) system. C^3I spark plugs fire simultaneously in pairs, on both compression and exhaust strokes; secondary cables therefore carry one high voltage pulse for every crankshaft revolution (twice the rate of conventional systems). C^3I comes in both Magnavox and Delco-Remy versions, which may differ in their firing voltages at a given engine rpm. Models with asterisk (*) above have Delco-Remy; all others have Magnavox.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm/idle, restart idle, restart 2500, two speed, & loaded	idle-N, 2500 rpm	analyzer lockout	see cause

FAILURE DESCRIPTION (continued)

Cause: Induction tachometers generate improper engine rpm values in response to extra pulses in C³I secondaries. Reading will be up to twice the actual rpm value, depending upon the voltage of the exhaust stroke firing pulse and the sensitivity of the tachometer. Analyzers with specified idle-neutral rpm limits or 2500 rpm stability limits may lock out (or vehicles may be tested at improper engine speed) based on incorrect rpm values.

Note: Although the data is limited, EPA is currently unaware of any computerized analyzer with an induction tachometer that will uniformly generate correct engine rpm values on both the Delco-Remy and the Magnavox versions of C³I. This includes systems that prompt for a "2-cycle" or "rotary" engine type and adjust the rpm value with a multiplier in the analyzer software.

DISPOSITION:

Field Fix: none yet identified.

Equipment Modifications: Analyzer hardware and/or software modifications are under investigation by several analyzer manufacturers. Contact the appropriate manufacturer or EPA for current status.

EPA-approved Alternative Test: No satisfactory alternative test procedure is currently available as a long-term solution to the C³I pattern case in programs that employ induction tachometers. On a temporary basis, EPA recommends either of the following: (1) refer failed vehicles to referee facilities where rpm lockout may be bypassed, or (2) permit regular licensed facilities to test affected vehicles with analyzers in diagnostic mode. If the second option is used, a printed copy of each test should be generated by the inspector and provided to the program administration to ensure proper vehicle counts and to verify compliance rates. Programs that have information on other alternatives that have proved effective for specific analyzer systems are encouraged to provide relevant data to EPA.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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IM PATTERN FAILURE SUMMARY

NUMBER: 85-11
PREPARED: 11/03/85
REPLACES: n/a

MANUFACTURER: General Motors

VEHICLE DESCRIPTION

Engine: 84-86 GM 5.0 L 4 bbl

Engine Family	Fed Cal	MY	Affected Models
D3G5.0V4NBM0	F	84	Cutlass Supreme/98/
D3G5.0V4NLAX	F	84	Delta 88/LeSabre/
D3G5.0W4NBA2	C	84	Custom Cruiser Wag/ Electra/Toronado/ Riviera
E3G5.0V4NBM1	F	85	same models as 1984
E3G5.0W4NBA3	C	85	same models as 1984
F3G5.0V4NBM2	F	86	same models as 1984
F3G5.0W4NBA4	C	86	same models as 1984

Notes: some additional 5.0-liter Pontiac and Chevrolet models in the 1986 model year may exhibit the same pattern failure.

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
restart-2500	2500 rpm	CO	?

Causes: (1) vehicle operates open-loop with enriched fuel metering and with diverted secondary air for 156 seconds after a restart. (2) Vehicle diverts secondary air after 25 seconds above 1200 rpm no load. (3) Vehicle operates open-loop with enriched fuel metering after extended idle, due to cool-down of oxygen sensor. Both open-loop operation and diverted air are apparently necessary to fail vehicle.

Subpart W Factors: extended idle followed by extended preconditioning will warm up oxygen sensor and re-initiate closed-loop fuel metering.

DISPOSITION

Field Fix: none yet identified.

Alternative Test Procedures: current EPA regulations do not explicitly prohibit use of non-restart tests and extended pre-test preconditioning on these vehicles. Programs electing to use procedures other than those above should consider providing temporary no-cost waivers in those cases where a repair facility demonstrates that the pattern failure is the source of the problem.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 86-01
PREPARED: 04/23/86
REPLACES: 85-12
11/03/85
PAGE: 1 of 1

Note: All sections with significant revisions from previous versions are marked with "#".

MANUFACTURER: Honda

VEHICLE DESCRIPTION

Engine: 82 Hond 1.8 L 2 bbl

Engine Family	Fed Cal	MY	Affected Models
CHN1.8V3AFE6	F	82	Prelude/Accord
CHN1.8V3ACF1	C	82	Prelude/Accord

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
2500 rpm-idle, restart-2500 & two speed	2500 rpm	CO	100% *

Cause: enriched fuel metering under off-idle, no-load conditions due to vacuum-modulated activation of carburetor power valve.

Subpart W Factors: none yet identified

Note: Honda predicts the 100% failure rate given above (*) for high altitude testing only. Available test data do not show the pattern failure at low altitude.

Field Fix: Honda TSB 84-053 describes a field fix which deactivates the power valve under some operating conditions. The Federal Test Procedure impacts of the fix have been determined by EPA and found to be acceptable.

Alternative Test Procedure: none identified.

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I/M PATTERN FAILURE SUMMARY

NUMBER: 85-13
PREPARED: 11/03/85
REPLACES: n/a
PAGE: 1 of 1

MANUFACTURER: Honda

VEHICLE DESCRIPTION

Engine: 84-85 Hond 1.8 L 2 bbl

Engine Family	Fed Cal	MY	Affected Models
EHN1.8V0FGF3	F	84	Prelude
EHN1.8V0FHC2	C	84	Prelude
FHN1.8V0FGF4	F	85	Prelude
FHN1.8V0FHC3	C	85	Prelude

FAILURE DESCRIPTION

EPA Test	Mode	Failure	%FR
idle, 2500 rpm-idle, two speed	idle-N	CO	40%

Cause: After three minutes of operation below 15 mph, vehicle operates open loop with enriched fuel metering and diverts secondary air to atmosphere.

Subpart W Factors: vehicles will fail other EPA tests if procedure is not completed within 3 minutes of restart or last operation above 15 mph.

Notes: timer controlling open loop operation and air diversion is reset by keyoff/restart or operation above 15 mph.

DISPOSITION

Field Fix: none yet identified.

Alternative Test Procedure: Current EPA regulations permit, but do not require, use of restart on these vehicles. EPA is currently reviewing a Honda petition that would require restart for the affected vehicles.

Late Model Vehicles with Unusual I/M Failure Rates at 207(b) Cutpoints

			Arizona I		FLT	Arizona II		FLT	Seattle		FLT	Connecticut		FLT
MY	MFR	ENG FAMILIES	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE
81-82	AMC	BAM258V2HP7	2024	20.5	9.3	2020	11.6	6.3	104	2.9	3.7	1458	5.5	4.6
		CAM258V2HE50	1003	18.8	6.9	1003	5.4	4.1	30	0.0	2.6	1158	1.5	2.6
81	Audi	BAD1.7V6FF04004F	209	13.4	9.3	209	12.9	6.3	194	3.6	3.7	297	7.4	4.6
83	BMW	CBM2.7V5FAB4	122	10.7	3.3	122	4.1	1.8	47	0.0	1.4	185	3.2	1.3
82	BMW	CBM3.2V5FAB4	128	13.3	6.9	128	9.4	4.1	42	0.0	2.6	123	3.3	2.6
83	BMW	CBM3.2V5FAB4	117	10.3	3.3	117	4.3	1.8	45	0.0	1.4	233	8.2	1.3
81	Chry	BCR5.2V4HC1	116	19.5	9.3	116	15.5	6.3	21	14.3	3.7	17	5.9	4.6
84	Chry	ECR2.2V5HCF1 ECR2.2V5HCL0	86	20.9	4.9	86	11.6	1.6						
81 .9	Chry	BCR3.7T1AA1 BCR3.7T1BC5	1158	29.8	21.4	1155	26.2	17.0	137	30.7	14.3	759	28.3	
81	Chry	BCR5.2V2HJ4	774	4.9	9.3	774	3.7	6.3	144	8.3	3.7	403	4.0	4.6
82	Chry	CCR1.7V2HBF7	267	6.4	6.9	267	5.2	4.1	78	3.8	2.6	3244	3.6	2.6
82	Chry	CCR2.2V2HNLX CCR2.2V2HFL1	131	8.4	6.9	131	5.3	4.1	25	0.0	2.6	420	2.4	2.6

See EPA's Current Summary of I/M Pattern Cases for additional information on this vehicle group.

			Arizona I		FLT	Arizona II		FLT	Seattle		FLT	Connecticut		FLT
Y	MFR	ENG FAMILIES	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE
84	Chry	ECR2.6V2FAJ9 ECR2.6V2BAS9	334	8.1	4.9	334	7.5	1.6						
81	Fiat	BFT2.0V5FA1	190	16.8	9.3	190	16.8	6.3	133	9.0	3.7	135	5.9	4.6
81-83	Ford	3.3GQF	10636	20.1	9.3	10621	8.9	6.3	3192	6.8	3.7	7083	5.9	4.6
		CFM3.3V1GXF9	5760	17.6	6.9	5755	7.0	4.1	831	5.8	2.6	4957	5.4	2.6
		DFM3.3V1GXFX	1374	11.4	3.3	1374	4.5	1.8	104	4.8	1.4	1830	3.6	1.3
81-82	Ford 5.0	4.2/5.0GCF 4.2/5.0GCC 4.2/5.0AAC	8140	38.9	9.3 6.9									
81	Ford	5.0CCF 5.0CCC	1275	21.5	9.3	1274	6.0	6.3	218	19.7	3.7	501	3.4	4.6
81	Ford	5.8WBPF 5.8WAXC	408	21.1	9.3	407	13.3	6.3	81	24.7	3.7	313	32.3	4.6
82	Ford	CFM5.0V2HCB2 CFM5.0V2HEC8 CFM5.0V2HGB2 CFM5.0V2HEF0	1194	24.0	6.9									
83	Ford	DFM5.0V5HLC5	1374	11.4	3.3	583	1.2	1.8	37	0.0	1.4	480	0.2	1.3
84	Ford	EFM3.8V2GXF1 EFM3.8V5HHF7	621	12.2	4.9	621	3.7	1.6						
84	Ford	EFM3.8V5HHF7 EFM3.8V5HHC4	431	17.2	4.9	431	3.0	1.6						

See EPA's Current Summary of I/M Pattern Cases for additional information on this vehicle group.

Y	MFR	ENG FAMILIES	Arizona I SIZE	Arizona I RATE	FLT RATE	Arizona II SIZE	Arizona II RATE	FLT RATE	Seattle SIZE	Seattle RATE	FLT RATE	Connecticut SIZE	Connecticut RATE	FLT RATE
84	Ford	EFM4.9T1HGG5	556	57.6	19.0	556	15.8	10.5						
84	Ford	EFM5.0V5HBF7 EFM5.0V5HBC4	1016	39.3	4.9	1016	3.8	1.6						
84	Ford	EFM5.8T4GAF3 EFM5.8T4HGG0	344	47.4	19.0	344	10.8	10.5						
82	Ford	CFM2.3V2GBF6 CFM2.3V2HAF7	1500	10.6	6.9	1499	7.8	4.1	582	7.9	2.6	2574	6.1	2.6
83	Ford	DFM1.6V2GDC7	303	4.3	3.3	303	3.6	1.8	50	6.0	1.4	2251	3.2	1.3
84	Ford	EFM1.6V2GDK7 EFM1.6V2GDC8	406	4.7	4.9	406	3.4	1.6						
83	Fuji	DFJ1.8T2AFD2 DFJ1.8T5FFH0	221	38.9	14.0	221	37.1	10.0	288	20.5	10.4	1673	11.7	6.9
81	GM	11W2TNQZ	7587	17.3	9.3	7574	15.4	6.3	2051	15.8	3.7	7786	15.6	4.6
83-84	GM	D1G1.6V2NEA0 D1G1.6W2NEA5	865	9.6	3.3	865	3.8	1.8	133	4.5	1.4	3093	10.7	1.3
		E1G1.6V2NEA1 E1G1.6W2NEA6	277	5.4	4.9	277	2.5	1.6						

See EPA's Current Summary of I/M Pattern Cases for additional information on this vehicle group.

			Arizona I		FLT	Arizona II		FLT	Seattle		FLT	Connecticut		FLT
Y	MFR	ENG FAMILIES	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE
83	GM	D2G2.5V5TPG6	1559	6.7	3.3	1559	3.6	1.8	441	6.1	1.4	5449	1.0	1.3
84	GM	E2G2.5V5TPG7	597	3.0	4.9	597	2.2	1.6						
83/2	GM	C4G4.1V4AEA8 C4G4.1W4AEA2	1279	3.9	3.3	1279	1.5	1.8	134	0.0	1.4	1087	0.2	1.3
82	GM	C1G3.8V2ACA0	1990	3.8	6.9	1989	3.1	4.1	552	3.6	2.6	3924	4.4	2.6
82	GM	C1G5.7V5NBM2 C1G5.7W5NBM7	1570	3.7	6.9	1568	2.7	4.1	181	4.4	2.6	788	3.9	2.6
82	GM	C1G5.7T4HAC5 C1G5.7T4HHC8	3039	9.6	17.2	3038	7.8	13.6	479	18.2	13.2	1430	17.1	9.2
83	GM	C1G5.0T4HGH2	2819	5.7	14.0	2817	4.5	10.0	226	11.5	10.4	1386	8.0	6.9
82	GM	C1G1.6V2TNR1 C1G1.6V2NEAX	1247	4.3	6.9	1246	3.7	4.1	194	1.5	2.6	6406	4.8	2.6
82	GM	C4G3.8V2TMA5	7508	5.5	6.9	7507	3.8	4.1	1410	2.3	2.6	11091	2.1	2.6
84	GM	E1G5.0W4NEAX	125	8.8	19.0	125	7.2	10.5						
83	GM	D1G5.7V4NDA0	750	8.7	14.0	748	7.1	10.0	49	4.1	10.4	606	8.1	6.9
83-84	Hond	DHN1.3V3AAF1 DHN1.3V3ABC0	379	16.9	3.3	377	7.7	1.8	222	1.4	1.4	618	4.7	1.3
		EHN1.3V3EAF3	126	16.7	4.9	126	12.7	1.6						
3-84	Hond	DHN1.5V3ACF6 DHN1.5V3ADC5	1403	18.3	3.3	1403	8.6	1.8	827	3.6	1.4	2100	4.0	1.3
		EHN1.5V3FCF0 EHN1.5V3FDCX	379	7.7	4.9	379	6.3	1.6						

See EPA's Current Summary of I/M Pattern Cases for additional information on this vehicle group.

Y	MFR	ENG FAMILIES	Arizona I SIZE	Arizona I RATE	FLT RATE	Arizona II SIZE	Arizona II RATE	FLT RATE	Seattle SIZE	Seattle RATE	FLT RATE	Connecticut SIZE	Connecticut RATE	FLT RATE
84	Hond	EHN1.8V0FHC2 EHN1.8V0FGF3	64	39.1	4.9	64	9.4	1.6						
81-82	Mazd	BTK1.5V2GC1	207	18.4	9.3	207	15.0	6.3	242	7.0	3.7	172	8.1	4.6
		CTK1.5V2GDD8	73	12.3	6.9	73	12.3	4.1	73	5.5	2.6	129	5.4	2.6
81	Mazd	BTK2.3T2AF3	578	47.6	21.4	574	43.7	17.0	374	28.9	14.3	184	17.9	9.9
82	Mazd	CTK2.0T2AFF8 CTK2.0T2AGG0	774	41.6	17.2	772	40.0	13.6	231	39.0	13.2	689	18.7	9.2
83-84	Mazd	DTK1.5V2HCC9 DTK1.5V2HDD1	265	6.8	3.3	265	3.4	1.8	145	2.8	1.4	880	3.6	1.3
		ETK1.5V2HFF8 ETK1.5V2HCG3	101	7.9	4.9	101	2.0	1.6						
83	Mazd	DTK2.0V2HFF7 DTK2.0V2HGGX	192	2.6	3.3	192	1.6	1.8	111	3.6	1.4	445	0.9	1.3
83	Mazd	CTK2.0T2AFF8 DTK2.0T2AHH4	546	53.5	14.0	545	51.4	10.0	209	48.8	10.4	1084	23.6	6.9
81-83	Mits	BMT2.6V2BF1 BMT2.6V2BC9	677	30.9	9.3	676	21.6	6.3	217	3.7	3.7	493	4.5	4.6
		CMT2.6V2BFD8 CMT2.6V2BCAX	298	47.3	6.9	297	33.3	4.1	107	20.6	2.6	662	17.2	2.6
		DMT2.6V2BFD9 DMT2.6V2BCA0	150	22.0	3.3	150	16.7	1.8	29	6.9	1.4	483	5.4	1.3
83	Mits	DMT1.6V2BFD1 DMT1.6V2BCA3	228	22.0	3.3	228	7.0	1.8	26	0.0	1.4	766	2.6	1.3

See EPA's Current Summary of I/M Pattern Cases for additional information on this vehicle group.

			Arizona I		FLT	Arizona II		FLT	Seattle		FLT	Connecticut		FLT
Y	MFR	ENG FAMILIES	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE
81-82	Niss	BNS1.2V2AB2 BNS1.2V2AC3	160	33.8	9.3	159	27.0	6.3	108	22.2	3.7	150	12.0	4.6
		CNS1.2V2AAFX CNS1.2V2ABC9	185	31.4	6.9	185	25.9	4.1	32	12.5	2.6	262	17.6	2.6
81	Niss	BNS1.5V2AB6 BNS1.5V2AC7	4047	23.4	9.3	4035	17.0	6.3	2067	8.6	3.7	4478	7.7	4.6
81-83	Niss	BNS2.8V5FD5 BNS2.8V5FE6	239	20.5	9.3	237	12.2	6.3	86	3.5	3.7	108	6.5	4.6
		CNS2.8V5FCF8	301	14.3	6.9	300	8.7	4.1	41	0.0	2.6	158	8.2	2.6
		DNS2.8V5FBF7 DNS2.8V5FBC4	149	12.8	3.3	149	6.7	1.8	12	0.0	1.4	114	2.6	1.3
82	Niss	CNS1.5V2AAF6 CNS1.5V9FAF5	1599	27.3	6.9	1595	20.6	4.1	439	8.4	2.6	2831	7.2	2.6
82	Niss	CNS1.5V2ACFX CNS1.5V2ADC9	1498	24.4	6.9	1495	19.0	4.1	569	9.5	2.6	3522	5.1	2.6
83	Niss	DNS1.6V2AAF2 DNS1.6V2FAC9	2274	7.9	3.3	2274	5.4	1.8	449	2.4	1.4	5295	1.3	1.3
83	Niss	CNS2.2T2AAF8	249	39.0	14.0	247	31.6	10.0	23	21.7	10.4	361	22.7	6.9
83-84	Niss	DNS2.4T2AAFX DNS2.4T9FAC6	904	35.7	14.0	904	31.1	10.0	72	20.8	10.4	460	27.8	6.9
		ENS2.4T2AAF0	588	47.6	19.0	588	42.9	10.5						
83	Niss	DNS2.8V5FAA0	743	6.7	3.3	742	3.5	1.8	178	0.0	1.4	987	1.0	1

See EPA's Current Summary of I/M Pattern Cases for additional information on this vehicle group.

			Arizona I		FLT	Arizona II		FLT	Seattle		FLT	Connecticut		FLT
Y	MFR	ENG FAMILIES	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE	SIZE	RATE	RATE
83	Niss	DNS2.0V2AAF7 DNS2.0V2AAC4	535	12.7	3.3	535	7.5	1.8	168	6.0	1.4	1951	2.3	1.3
82	Niss	CNS2.2T2AAF8 CNS2.2T2ABC7	3031	32.7	17.2	3014	27.6	13.6	798	27.8	13.2	1352	16.9	9.2
83	Niss	DNS2.4T2ABF1	140	23.6	14.0	139	21.6	10.0	9	0.0	10.4	76	3.9	6.9
81	Rnlt	BRE1.4V2AY1 BRE1.4V2FR1	103	17.5	9.3	102	14.7	6.3	66	4.5	3.7	392	6.6	4.6
81-82	Toyt	BTY1.3V2AF8 BTY1.3V2AC5	693	10.5	9.3	693	9.7	6.3	352	4.3	3.7	790	4.2	4.6
		CTY1.3V2AFF CTY1.3V2ACC	448	12.5	6.9	448	10.5	4.1	150	6.7	2.6	705	3.0	2.6
81	Volk	BVW2.0T5FA8 BVW2.0T5AF3	218	45.9	21.4	218	45.0	17.0	181	54.1	14.3	73	35.6	9.9
82	Volk	CVW1.7V6FSFX CVW1.7V6FSC7	171	12.9	6.9	170	11.2	4.1	164	3.7	2.6	502	3.6	2.6
81	Volk	BVW2.0T5AF3 BVW2.0T5FA8	155	51.0	17.2	155	47.7	13.6	141	74.5	13.2	81	38.3	9.2
81	Volk	BVW1.7T6AA737PF BVW1.7T6FA6.37P	161	29.8	21.4	159	27.0	17.0	167	44.3	14.3	75	24.0	9.9

See EPA's Current Summary of I/M Pattern Cases for additional information on this vehicle group.

Appendix G

I/M Summary Statistics

Four Vehicle Categories,
All Smog Check Stations

CALIF TAS DATA (ALL STATIONS) - 1981 AND LATER VEHICLES
CALIFORNIA I/M SUMMARY STATISTICS

10-SEP-1987

Record Counts

Test Records Processed:	177174
Initial Test Records:	151338
After Repair Test Records:	25621
Referee Test Records:	215

Average Odometer Readings

All Vehicles:	44809
Initial Test Vehicles:	43410
After Repair Test Vehicles:	53044
Referee Test Vehicles:	47746

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.4	22.6	--	--	1.7	21.6	0.9	20.9	0.8	5.4	8.1
After Repair	76.0	22.6	5.8	23.1	4.0	97.8	2.2	96.0	1.7	31.7	34.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	73	830	0.51	55	2499
Initial Test - Pass Vehicles	0.07	30	830	0.16	28	2499
Initial Test - Fail Vehicles	1.27	220	832	1.70	146	2497
Initial Test - Underhood Fail Only	0.16	44	828	0.26	34	2497
Initial Test - Tailpipe Fail Only	1.29	223	833	1.74	148	2497
After Repair Test - All Vehicles	0.55	108	857	0.94	79	2486
After Repair Test - Pass Vehicles	0.20	53	856	0.36	43	2487
After Repair Test - Fail Vehicles	1.27	212	854	2.06	148	2485
After Repair Test - Inc. Repr. Vehicles	0.53	120	855	1.05	80	2488
After Repair Test - Waived Vehicles	1.01	190	866	1.76	132	2480
After Repair Test - Underhood Fail Only	0.10	38	829	0.20	30	2484
After Repair Test - Tailpipe Fail Only	1.15	203	861	1.93	141	2483
Referee Test - All Vehicles	1.64	243	846	1.57	163	2493
Referee Test - Pass Vehicles	0.99	102	835	0.62	87	2485
Referee Test - Fail Vehicles	2.11	347	854	2.26	219	2498
Referee Test - Underhood Fail Only	1.63	194	772	0.92	64	2393
Referee Test - Tailpipe Fail Only	1.89	337	870	2.42	202	2513

Repair Action Percentages

	Yes	No	Excd
MIS	30.5	59.1	10.2
TMG	32.3	66.9	0.6
A/F	51.9	29.2	18.7
CRK	7.8	91.5	0.4
EVP	6.8	92.8	0.2
EXH	10.1	88.2	1.5
EGR	7.2	90.6	2.0
ANY	79.5	95.7	29.0

Average Repair Costs

Parts Cost: $ 11.08 Labor Cost: $ 21.51

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.8
Pass	99.5	89.0	75.3	98.9	98.7	36.9	61.8	91.7	93.8	67.3	97.3	68.8	99.9
N/A	0.4	10.8	24.6	1.0	1.2	63.1	38.1	8.2	6.2	32.7	2.7	31.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	82.9	60.7	55.4	91.9
Fail	0.3	0.4	0.6	1.2
N/A	16.8	22.8	27.8	39.2

Record Counts

Test Records Processed:	44141
Initial Test Records:	37385
After Repair Test Records:	6718
Referee Test Records:	38

Average Odometer Readings

All Vehicles:	42324
Initial Test Vehicles:	41035
After Repair Test Vehicles:	49438
Referee Test Vehicles:	52871

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	75.6	24.4	--	--	1.6	23.5	0.9	22.8	0.7	5.3	9.3
After Repair	77.5	25.6	6.6	21.8	3.1	98.2	1.8	96.9	1.3	30.6	34.4
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.33	74	833	0.52	53	2498
Initial Test - Pass Vehicles	0.04	28	831	0.13	26	2499
Initial Test - Fail Vehicles	1.23	217	840	1.72	134	2496
Initial Test - Underhood Fail Only	0.07	38	838	0.21	32	2502
Initial Test - Tailpipe Fail Only	1.27	221	840	1.78	136	2496
After Repair Test - All Vehicles	0.49	100	858	0.94	70	2487
After Repair Test - Pass Vehicles	0.12	48	856	0.31	39	2490
After Repair Test - Fail Vehicles	1.17	191	854	2.17	125	2483
After Repair Test - Inc. Repr. Vehicles	0.48	126	863	1.19	79	2497
After Repair Test - Waived Vehicles	1.00	181	869	1.76	117	2481
After Repair Test - Underhood Fail Only	0.12	47	832	0.18	36	2486
After Repair Test - Tailpipe Fail Only	1.10	188	861	2.00	122	2482
Referee Test - All Vehicles	0.61	184	868	1.01	94	2524
Referee Test - Pass Vehicles	0.06	24	856	0.29	33	2510
Referee Test - Fail Vehicles	0.90	267	875	1.39	125	2531
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.81	270	879	1.37	123	2532

Repair Action Percentages

	Yes	No	Excd
MIS	30.7	59.2	10.0
TMG	31.5	67.8	0.6
A/F	48.2	33.0	18.7
CRK	7.3	92.2	0.4
EVP	6.3	93.3	0.3
EXH	10.1	88.4	1.5
EGR	6.7	91.7	1.5
ANY	79.2	96.5	28.1

Average Repair Costs

Parts Cost: $ 11.13 Labor Cost: $ 21.41

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.6
Pass	99.9	94.0	82.1	99.9	99.9	37.5	62.3	99.8	95.7	74.2	97.2	68.5	100.0
N/A	0.1	5.8	17.8	0.1	0.1	62.4	37.6	0.1	4.3	25.8	2.8	31.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	82.2	59.6	59.2	92.0
Fail	0.5	0.3	0.5	1.2
N/A	17.3	22.3	22.5	35.4

Record Counts

Test Records Processed:	15373
Initial Test Records:	12162
After Repair Test Records:	3194
Referee Test Records:	17

Average Odometer Readings

All Vehicles:	43787
Initial Test Vehicles:	42996
After Repair Test Vehicles:	46776
Referee Test Vehicles:	48553

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	64.5	35.5	--	--	1.7	34.7	0.8	33.8	0.8	8.2	14.2
After Repair	76.5	29.7	7.5	22.9	2.7	98.4	1.6	97.3	1.1	26.6	38.2
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.43	103	844	0.75	70	2501
Initial Test - Pass Vehicles	0.06	34	844	0.17	32	2505
Initial Test - Fail Vehicles	1.10	227	844	1.82	139	2495
Initial Test - Underhood Fail Only	0.10	43	835	0.19	36	2518
Initial Test - Tailpipe Fail Only	1.12	229	845	1.85	139	2494
After Repair Test - All Vehicles	0.51	110	856	1.02	77	2487
After Repair Test - Pass Vehicles	0.13	50	853	0.33	41	2490
After Repair Test - Fail Vehicles	1.14	198	850	2.29	132	2483
After Repair Test - Inc. Repr. Vehicles	0.44	126	865	1.32	84	2500
After Repair Test - Waived Vehicles	0.99	196	875	1.72	126	2480
After Repair Test - Underhood Fail Only	0.12	60	834	0.23	45	2493
After Repair Test - Tailpipe Fail Only	1.08	197	861	2.06	130	2482
Referee Test - All Vehicles	0.71	257	871	1.44	103	2533
Referee Test - Pass Vehicles	0.00	19	883	0.37	38	2477
Referee Test - Fail Vehicles	0.86	308	869	1.68	117	2545
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.68	316	876	1.66	113	2549

Repair Action Percentages

	Yes	No	Excd
MIS	32.3	56.7	11.0
TMG	33.3	66.2	0.5
A/F	47.6	33.8	18.5
CRK	7.8	92.0	0.2
EVP	6.9	92.9	0.3
EXH	9.6	88.9	1.4
EGR	6.9	91.8	1.4
ANY	79.0	96.5	28.9

Average Repair Costs

Parts Cost: $ 10.63 Labor Cost: $ 21.89

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.6
Pass	99.9	98.9	83.8	99.8	99.9	46.3	53.5	99.9	96.3	72.2	96.5	67.6	100.0
N/A	0.1	0.9	16.1	0.1	0.1	53.6	46.4	0.0	3.7	27.8	3.5	32.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	83.0	57.6	57.1	91.6
Fail	0.4	0.4	0.6	1.3
N/A	16.6	22.8	23.2	34.8

Record Counts

Test Records Processed:	9785
Initial Test Records:	7562
After Repair Test Records:	2204
Referee Test Records:	19

Average Odometer Readings

All Vehicles:	63052
Initial Test Vehicles:	62260
After Repair Test Vehicles:	65653
Referee Test Vehicles:	76274

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	61.9	38.1	--	--	3.4	36.7	1.5	34.8	1.9	13.3	5.3
After Repair	72.9	18.6	5.6	26.5	3.2	98.6	1.4	96.8	1.8	45.0	18.9
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	88	871	1.05	72	2506
Initial Test - Pass Vehicles	0.07	30	877	0.42	34	2503
Initial Test - Fail Vehicles	0.78	183	862	2.06	134	2512
Initial Test - Underhood Fail Only	0.06	32	869	0.45	33	2512
Initial Test - Tailpipe Fail Only	0.81	186	862	2.11	137	2511
After Repair Test - All Vehicles	0.30	88	887	1.04	75	2482
After Repair Test - Pass Vehicles	0.12	46	889	0.55	44	2480
After Repair Test - Fail Vehicles	0.63	170	876	1.95	144	2489
After Repair Test - Inc. Repr. Vehicles	0.29	101	890	1.11	66	2472
After Repair Test - Waived Vehicles	0.56	146	891	1.75	113	2481
After Repair Test - Underhood Fail Only	0.03	34	895	0.56	36	2476
After Repair Test - Tailpipe Fail Only	0.60	157	885	1.84	127	2485
Referee Test - All Vehicles	0.97	199	883	1.85	159	2499
Referee Test - Pass Vehicles	0.12	64	871	0.60	68	2520
Referee Test - Fail Vehicles	1.46	278	890	2.58	212	2488
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.42	293	885	2.77	231	2490

Repair Action Percentages

	Yes	No	Excd
MIS	29.4	60.9	9.5
TMG	35.3	63.7	0.7
A/F	52.9	25.5	21.4
CRK	8.6	90.8	0.4
EVP	7.4	92.2	0.1
EXH	11.0	86.8	1.9
EGR	7.8	90.2	1.8
ANY	80.8	95.3	31.1

Average Repair Costs

Parts Cost: $ 9.63 Labor Cost: $ 20.71

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.6
Mod	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Miss	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.0	0.4	0.0	0.3	0.2	0.0	0.1	0.2	0.0	0.0	0.0	0.1	1.3
Pass	99.9	99.6	100.0	99.6	99.7	35.6	64.2	99.8	97.8	62.4	96.5	70.2	100.0
N/A	0.1	0.1	0.0	0.1	0.1	64.4	35.7	0.0	2.2	37.6	3.4	29.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	81.2	59.8	59.6	91.0
Fail	1.1	0.8	0.9	2.5
N/A	17.8	21.5	21.6	35.1

Appendix H

I/M Summary Statistics

Non-EPA Pattern Failure Vehicles
with High Fail Rates

Fleet and Individual Vehicle Groups

All Smog Check Stations,
New Car Dealers, and
All Other Stations

Entire Fleet,
by Smog Check Facility Type

Record Counts

Test Records Processed:	9785
Initial Test Records:	7562
After Repair Test Records:	2204
Referee Test Records:	19

Average Odometer Readings

All Vehicles:	63052
Initial Test Vehicles:	62260
After Repair Test Vehicles:	65653
Referee Test Vehicles:	76274

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	61.9	38.1	--	--	3.4	36.7	1.5	34.8	1.9	13.3	5.3
After Repair	72.9	18.6	5.6	26.5	3.2	98.6	1.4	96.8	1.8	45.0	18.9
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	88	871	1.05	72	2506
Initial Test - Pass Vehicles	0.07	30	877	0.42	34	2503
Initial Test - Fail Vehicles	0.78	183	862	2.06	134	2512
Initial Test - Underhood Fail Only	0.06	32	869	0.45	33	2512
Initial Test - Tailpipe Fail Only	0.81	186	862	2.11	137	2511
After Repair Test - All Vehicles	0.30	88	887	1.04	75	2482
After Repair Test - Pass Vehicles	0.12	46	889	0.55	44	2480
After Repair Test - Fail Vehicles	0.63	170	876	1.95	144	2489
After Repair Test - Inc. Repr. Vehicles	0.29	101	890	1.11	66	2472
After Repair Test - Waived Vehicles	0.56	146	891	1.75	113	2481
After Repair Test - Underhood Fail Only	0.03	34	895	0.56	36	2476
After Repair Test - Tailpipe Fail Only	0.60	157	885	1.84	127	2485
Referee Test - All Vehicles	0.97	199	883	1.85	159	2499
Referee Test - Pass Vehicles	0.12	64	871	0.60	68	2520
Referee Test - Fail Vehicles	1.46	278	890	2.58	212	2488
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.42	293	885	2.77	231	2490

Repair Action Percentages

	Yes	No	Excd
MIS	29.4	60.9	9.5
TMG	35.3	63.7	0.7
A/F	52.9	25.5	21.4
CRK	8.6	90.8	0.4
EVP	7.4	92.2	0.1
EXH	11.0	86.8	1.9
EGR	7.8	90.2	1.8
ANY	80.8	95.3	31.1

Average Repair Costs

Parts Cost: $ 9.63 Labor Cost: $ 20.71

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.6
Mod	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Miss	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.0	0.4	0.0	0.3	0.2	0.0	0.1	0.2	0.0	0.0	0.0	0.1	1.3
Pass	99.9	99.6	100.0	99.6	99.7	35.6	64.2	99.8	97.8	62.4	96.5	70.2	100.0
N/A	0.1	0.1	0.0	0.1	0.1	64.4	35.7	0.0	2.2	37.6	3.4	29.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	81.2	59.8	59.6	91.0
Fail	1.1	0.8	0.9	2.5
N/A	17.8	21.5	21.6	35.1

Record Counts

Test Records Processed:	1057
Initial Test Records:	873
After Repair Test Records:	184
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	60712
Initial Test Vehicles:	59905
After Repair Test Vehicles:	64541
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	68.4	31.6	--	--	1.6	30.7	0.9	30.0	0.7	11.0	5.8
After Repair	86.9	20.3	9.8	13.1	5.0	100.0	0.0	95.0	5.0	50.0	15.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.31	73	874	0.86	56	2497
Initial Test - Pass Vehicles	0.07	26	876	0.36	28	2496
Initial Test - Fail Vehicles	0.84	174	871	1.94	118	2501
Initial Test - Underhood Fail Only	0.01	24	896	0.23	28	2434
Initial Test - Tailpipe Fail Only	0.86	178	872	1.97	118	2503
After Repair Test - All Vehicles	0.22	74	890	0.88	67	2482
After Repair Test - Pass Vehicles	0.12	46	888	0.49	40	2480
After Repair Test - Fail Vehicles	0.50	157	894	2.02	149	2504
After Repair Test - Inc. Repr. Vehicles	0.38	93	911	1.11	67	2453
After Repair Test - Waived Vehicles	0.46	128	901	1.68	115	2463
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.48	145	897	1.90	136	2490
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	29.3	62.0	8.7
TMG	28.8	70.7	0.5
A/F	50.5	35.3	14.1
CRK	7.6	91.8	0.5
EVP	7.1	92.4	0.5
EXH	24.5	71.2	4.3
EGR	10.9	88.6	0.5
ANY	88.6	94.0	23.4

Average Repair Costs

Parts Cost: $ 18.80 Labor Cost: $ 33.47

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.3
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.0	0.1	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.8
Pass	100.0	99.8	100.0	99.9	99.7	29.2	70.7	99.7	97.5	67.9	98.6	69.3	100.0
N/A	0.0	0.0	0.0	0.0	0.2	70.8	29.3	0.0	2.5	32.1	1.4	30.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	89.2	65.8	65.2	94.6
Fail	0.1	0.7	0.8	1.4
N/A	10.7	28.1	28.5	35.3

Record Counts

Test Records Processed:	8728
Initial Test Records:	6689
After Repair Test Records:	2020
Referee Test Records:	19

Average Odometer Readings

All Vehicles:	63335
Initial Test Vehicles:	62567
After Repair Test Vehicles:	65754
Referee Test Vehicles:	76274

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	61.0	39.0	--	--	3.6	37.5	1.5	35.4	2.1	13.6	5.2
After Repair	71.7	18.5	5.2	27.7	3.2	98.5	1.5	96.8	1.7	44.8	19.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	90	871	1.07	74	2508
Initial Test - Pass Vehicles	0.07	31	877	0.43	35	2504
Initial Test - Fail Vehicles	0.78	184	861	2.07	135	2513
Initial Test - Underhood Fail Only	0.06	32	867	0.47	34	2519
Initial Test - Tailpipe Fail Only	0.80	187	861	2.12	139	2512
After Repair Test - All Vehicles	0.30	89	887	1.06	76	2482
After Repair Test - Pass Vehicles	0.12	46	889	0.56	44	2480
After Repair Test - Fail Vehicles	0.65	171	875	1.94	144	2488
After Repair Test - Inc. Repr. Vehicles	0.28	103	886	1.11	66	2475
After Repair Test - Waived Vehicles	0.56	146	890	1.75	113	2482
After Repair Test - Underhood Fail Only	0.03	34	895	0.56	36	2476
After Repair Test - Tailpipe Fail Only	0.60	157	885	1.84	127	2485
Referee Test - All Vehicles	0.97	199	883	1.85	159	2499
Referee Test - Pass Vehicles	0.12	64	871	0.60	68	2520
Referee Test - Fail Vehicles	1.46	278	890	2.58	212	2488
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.42	293	885	2.77	231	2490

Repair Action Percentages

	Yes	No	Excd
MIS	29.4	60.8	9.6
TMG	35.9	63.1	0.7
A/F	53.1	24.7	22.0
CRK	8.7	90.7	0.3
EVP	7.5	92.2	0.1
EXH	9.8	88.3	1.7
EGR	7.5	90.3	1.9
ANY	80.1	95.4	31.8

Average Repair Costs

Parts Cost: $ 8.81 Labor Cost: $ 19.57

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.6
Mod	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Miss	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4
Totl	0.0	0.4	0.0	0.3	0.3	0.0	0.1	0.1	0.0	0.0	0.0	0.1	1.4
Pass	99.9	99.6	100.0	99.6	99.7	36.4	63.3	99.9	97.8	61.7	96.2	70.3	100.0
N/A	0.1	0.1	0.0	0.1	0.1	63.6	36.6	0.0	2.2	38.3	3.7	29.5	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	80.1	59.0	58.8	90.6
Fail	1.2	0.9	1.0	2.7
N/A	18.7	20.6	20.7	35.1

Individual Vehicle Groups,
by Smog Check Facility Type

All Smog Check Stations

Record Counts

Test Records Processed:	338
Initial Test Records:	229
After Repair Test Records:	109
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	62745
Initial Test Vehicles:	61518
After Repair Test Vehicles:	65322
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	38.0	62.0	--	--	4.8	61.6	0.4	57.2	4.4	27.1	4.8
After Repair	67.0	23.9	9.1	33.0	10.3	89.7	10.3	89.7	0.0	62.1	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.76	139	868	1.61	146	2491
Initial Test - Pass Vehicles	0.06	40	867	0.22	53	2476
Initial Test - Fail Vehicles	1.18	199	868	2.47	203	2500
Initial Test - Underhood Fail Only	1.20	129	866	1.04	74	2522
Initial Test - Tailpipe Fail Only	1.21	205	864	2.50	206	2500
After Repair Test - All Vehicles	0.28	84	880	1.18	106	2452
After Repair Test - Pass Vehicles	0.07	66	871	0.40	63	2445
After Repair Test - Fail Vehicles	0.26	90	868	2.22	170	2455
After Repair Test - Inc. Repr. Vehicles	0.14	209	867	0.92	109	2486
After Repair Test - Waived Vehicles	0.70	115	908	2.02	148	2462
After Repair Test - Underhood Fail Only	0.00	26	938	0.49	71	2379
After Repair Test - Tailpipe Fail Only	0.55	109	888	2.21	163	2464
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	30.3	64.2	5.5
TMG	37.6	62.4	0.0
A/F	47.7	19.3	33.0
CRK	10.1	89.9	0.0
EVP	11.9	88.1	0.0
EXH	11.9	88.1	0.0
EGR	8.3	89.0	2.8
ANY	82.6	93.6	36.7

Average Repair Costs

Parts Cost: $ 10.92 Labor Cost: $ 23.17

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	1.3
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4
Totl	0.0	0.4	0.0	0.9	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	2.2
Pass	100.0	99.6	100.0	99.1	100.0	100.0	0.0	99.6	95.2	11.4	95.2	63.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.8	88.6	4.8	36.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	68.6	41.0	40.6	79.9
Fail	0.0	2.6	2.6	4.4
N/A	31.4	31.0	31.4	55.9

Record Counts

Test Records Processed:	430
Initial Test Records:	307
After Repair Test Records:	120
Referee Test Records:	3

Average Odometer Readings

All Vehicles:	62235
Initial Test Vehicles:	61023
After Repair Test Vehicles:	65078
Referee Test Vehicles:	72467

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	47.6	52.4	--	--	2.9	52.1	0.3	49.5	2.6	23.1	3.6
After Repair	75.9	11.1	5.6	23.1	4.0	100.0	0.0	96.0	4.0	40.0	32.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.83	136	846	1.19	114	2502
Initial Test - Pass Vehicles	0.06	50	849	0.25	56	2500
Initial Test - Fail Vehicles	1.52	214	843	2.04	167	2504
Initial Test - Underhood Fail Only	0.00	23	907	0.01	23	2628
Initial Test - Tailpipe Fail Only	1.49	202	844	2.05	164	2501
After Repair Test - All Vehicles	0.39	87	852	0.80	86	2476
After Repair Test - Pass Vehicles	0.09	47	858	0.32	54	2472
After Repair Test - Fail Vehicles	1.00	144	818	2.83	174	2439
After Repair Test - Inc. Repr. Vehicles	0.66	112	890	1.38	111	2388
After Repair Test - Waived Vehicles	1.09	192	846	1.44	151	2511
After Repair Test - Underhood Fail Only	0.00	53	880	0.01	31	2368
After Repair Test - Tailpipe Fail Only	0.97	178	830	1.87	160	2485
Referee Test - All Vehicles	0.02	103	847	0.12	222	2496
Referee Test - Pass Vehicles	0.02	66	878	0.05	58	2510
Referee Test - Fail Vehicles	0.01	176	786	0.25	550	2468
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.01	176	786	0.25	550	2468

Repair Action Percentages

	Yes	No	Excd
MIS	25.8	65.8	8.3
TMG	37.5	62.5	0.0
A/F	65.0	16.7	18.3
CRK	13.3	86.7	0.0
EVP	9.2	90.0	0.8
EXH	10.0	87.5	2.5
EGR	9.2	90.0	0.8
ANY	80.0	93.3	27.5

Average Repair Costs

Parts Cost: $ 6.66 Labor Cost: $ 18.10

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Miss	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Totl	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Pass	100.0	99.0	100.0	100.0	100.0	100.0	0.0	100.0	96.1	8.5	95.4	68.1	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	3.9	91.5	4.6	31.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	66.4	49.5	48.9	82.4
Fail	0.0	0.7	1.3	2.0
N/A	33.6	27.0	27.0	51.1

Record Counts

Test Records Processed:	1913
Initial Test Records:	1432
After Repair Test Records:	479
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	62705
Initial Test Vehicles:	62398
After Repair Test Vehicles:	63581
Referee Test Vehicles:	72900

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	56.5	43.5	--	--	2.4	42.7	0.8	41.1	1.5	18.0	5.6
After Repair	74.5	21.0	4.5	25.3	3.0	98.0	2.0	97.0	1.0	58.0	14.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.18	81	864	1.38	111	2511
Initial Test - Pass Vehicles	0.03	32	870	0.41	51	2509
Initial Test - Fail Vehicles	0.38	145	856	2.65	189	2514
Initial Test - Underhood Fail Only	0.02	51	829	0.54	73	2517
Initial Test - Tailpipe Fail Only	0.40	146	857	2.69	190	2513
After Repair Test - All Vehicles	0.17	76	875	1.06	92	2495
After Repair Test - Pass Vehicles	0.07	40	879	0.53	57	2491
After Repair Test - Fail Vehicles	0.30	158	864	1.92	176	2507
After Repair Test - Inc. Repr. Vehicles	0.07	57	875	0.83	57	2495
After Repair Test - Waived Vehicles	0.35	116	873	1.91	123	2496
After Repair Test - Underhood Fail Only	0.01	41	898	0.54	44	2449
After Repair Test - Tailpipe Fail Only	0.34	138	869	1.94	149	2503
Referee Test - All Vehicles	1.42	481	953	4.74	309	2582
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	1.42	481	953	4.74	309	2582
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.42	481	953	4.74	309	2582

Repair Action Percentages

	Yes	No	Excd
MIS	32.2	59.5	7.9
TMG	37.4	61.2	1.0
A/F	51.4	27.6	20.7
CRK	10.2	88.9	0.4
EVP	9.0	90.2	0.4
EXH	11.3	86.6	1.7
EGR	7.5	91.2	0.8
ANY	80.4	93.9	28.2

Average Repair Costs

Parts Cost: $ 8.28 Labor Cost: $ 20.18

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Mod	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Pass	100.0	100.0	100.0	99.7	99.7	31.4	68.6	100.0	98.0	62.2	96.9	71.0	100.0
N/A	0.0	0.0	0.0	0.1	0.3	68.6	31.4	0.0	2.0	37.8	3.1	29.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	80.4	58.2	59.1	89.3
Fail	1.0	1.2	0.3	2.2
N/A	18.6	22.2	22.3	36.5

Record Counts

Test Records Processed:	2051
Initial Test Records:	1592
After Repair Test Records:	458
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	64749
Initial Test Vehicles:	64298
After Repair Test Vehicles:	66251
Referee Test Vehicles:	95400

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	59.8	40.2	--	--	3.6	38.8	1.4	36.6	2.1	23.9	2.3
After Repair	73.1	15.1	4.5	25.6	5.9	99.0	1.0	94.1	4.9	63.7	12.7
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.14	65	872	1.25	50	2513
Initial Test - Pass Vehicles	0.02	24	878	0.57	28	2506
Initial Test - Fail Vehicles	0.31	124	862	2.26	83	2523
Initial Test - Underhood Fail Only	0.02	19	867	0.63	21	2549
Initial Test - Tailpipe Fail Only	0.31	120	862	2.31	84	2522
After Repair Test - All Vehicles	0.11	60	885	1.17	51	2485
After Repair Test - Pass Vehicles	0.04	34	887	0.67	29	2487
After Repair Test - Fail Vehicles	0.27	116	863	2.38	101	2503
After Repair Test - Inc. Repr. Vehicles	0.08	60	896	1.38	43	2518
After Repair Test - Waived Vehicles	0.21	104	893	1.91	86	2470
After Repair Test - Underhood Fail Only	0.03	31	877	0.83	22	2499
After Repair Test - Tailpipe Fail Only	0.24	103	885	2.12	93	2481
Referee Test - All Vehicles	0.98	321	758	4.76	214	2344
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.98	321	758	4.76	214	2344
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.98	321	758	4.76	214	2344

Repair Action Percentages

	Yes	No	Excd
MIS	27.5	65.9	6.3
TMG	35.2	64.0	0.7
A/F	53.1	26.9	19.9
CRK	9.4	90.0	0.4
EVP	7.2	92.6	0.0
EXH	11.4	85.4	3.1
EGR	9.4	87.1	3.3
ANY	79.7	95.2	30.8

Average Repair Costs

Parts Cost: $ 10.72 Labor Cost: $ 22.40

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.4
Mod	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3
Totl	0.0	0.3	0.1	0.2	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.1	0.8
Pass	99.9	99.6	99.9	99.6	99.8	31.7	68.3	99.8	97.9	63.1	96.7	71.5	100.0
N/A	0.1	0.1	0.0	0.2	0.1	68.3	31.7	0.0	2.1	36.9	3.3	28.5	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	85.7	61.4	61.1	93.3
Fail	1.3	1.0	1.3	3.1
N/A	13.1	18.7	18.7	28.5

Record Counts

Test Records Processed:	5053
Initial Test Records:	4002
After Repair Test Records:	1038
Referee Test Records:	13

Average Odometer Readings

All Vehicles:	62583
Initial Test Vehicles:	61537
After Repair Test Vehicles:	66445
Referee Test Vehicles:	76200

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	67.1	32.9	--	--	3.6	31.1	1.8	29.3	1.8	5.8	6.6
After Repair	72.4	19.6	6.2	27.3	1.3	99.6	0.4	98.7	0.8	30.0	24.5

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.42	94	876	0.80	60	2503
Initial Test - Pass Vehicles	0.10	30	881	0.39	29	2501
Initial Test - Fail Vehicles	1.07	224	866	1.64	121	2507
Initial Test - Underhood Fail Only	0.07	31	876	0.38	30	2498
Initial Test - Tailpipe Fail Only	1.13	234	866	1.68	125	2507
After Repair Test - All Vehicles	0.43	105	899	0.99	73	2479
After Repair Test - Pass Vehicles	0.19	52	900	0.56	41	2477
After Repair Test - Fail Vehicles	0.94	206	892	1.72	138	2484
After Repair Test - Inc. Repr. Vehicles	0.42	113	896	1.11	65	2456
After Repair Test - Waived Vehicles	0.72	175	899	1.61	112	2479
After Repair Test - Underhood Fail Only	0.08	34	897	0.31	30	2564
After Repair Test - Tailpipe Fail Only	0.82	189	897	1.66	124	2482
Referee Test - All Vehicles	1.11	169	889	1.58	117	2500
Referee Test - Pass Vehicles	0.16	63	868	0.82	72	2524
Referee Test - Fail Vehicles	1.71	235	903	2.06	146	2484
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.68	253	899	2.29	166	2487

Repair Action Percentages

	Yes	No	Excd
MIS	29.3	58.4	12.1
TMG	34.0	65.1	0.7
A/F	52.6	25.7	21.5
CRK	6.7	92.7	0.4
EVP	6.2	93.6	0.0
EXH	10.8	87.4	1.6
EGR	7.0	91.2	1.5
ANY	81.4	96.4	32.5

Average Repair Costs

Parts Cost: $ 10.00 Labor Cost: $ 20.26

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.3	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.8
Mod	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.5
Miss	0.0	0.1	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.6
Totl	0.0	0.4	0.0	0.3	0.4	0.0	0.2	0.2	0.0	0.1	0.1	0.2	1.9
Pass	99.9	99.5	100.0	99.6	99.5	30.0	69.6	99.8	97.9	69.2	96.5	70.0	100.0
N/A	0.0	0.0	0.0	0.1	0.0	69.9	30.3	0.0	2.1	30.7	3.4	29.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	81.5	61.5	61.0	92.1
Fail	1.1	0.6	0.9	2.3
N/A	17.4	21.4	21.5	34.9

Record Counts

Test Records Processed:	39
Initial Test Records:	27
After Repair Test Records:	12
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	61656
Initial Test Vehicles:	61474
After Repair Test Vehicles:	62067
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	40.7	59.3	--	--	0.0	59.3	0.0	59.3	0.0	18.5	7.4
After Repair	72.7	9.1	0.0	27.3	0.0	100.0	0.0	100.0	0.0	66.7	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.67	151	852	1.62	138	2491
Initial Test - Pass Vehicles	0.00	46	825	0.18	49	2483
Initial Test - Fail Vehicles	1.14	223	870	2.61	199	2496
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.14	223	870	2.61	199	2496
After Repair Test - All Vehicles	0.21	71	879	0.93	103	2464
After Repair Test - Pass Vehicles	0.01	53	860	0.42	65	2475
After Repair Test - Fail Vehicles	0.01	155	870	1.76	306	2664
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.80	91	932	2.01	139	2368
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.60	107	917	1.95	181	2442
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	25.0	75.0	0.0
TMG	16.7	83.3	0.0
A/F	66.7	8.3	25.0
CRK	8.3	91.7	0.0
EVP	16.7	83.3	0.0
EXH	8.3	91.7	0.0
EGR	8.3	91.7	0.0
ANY	83.3	91.7	25.0

Average Repair Costs

Parts Cost: $ 11.50 Labor Cost: $ 33.25

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pass	100.0	100.0	100.0	100.0	100.0	100.0	0.0	100.0	92.6	22.2	96.3	59.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	7.4	77.8	3.7	40.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	92.6	48.1	48.1	96.3
Fail	0.0	0.0	0.0	0.0
N/A	7.4	37.0	37.0	44.4

Record Counts

Test Records Processed:	39
Initial Test Records:	30
After Repair Test Records:	9
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	62097
Initial Test Vehicles:	58377
After Repair Test Vehicles:	74500
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	60.0	40.0	--	--	3.3	40.0	0.0	36.7	3.3	20.0	0.0
After Repair	77.8	0.0	0.0	22.2	0.0	100.0	0.0	100.0	0.0	50.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.80	113	780	1.23	99	2526
Initial Test - Pass Vehicles	0.06	36	755	0.29	41	2550
Initial Test - Fail Vehicles	1.91	227	819	2.66	186	2489
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	1.69	197	820	2.53	164	2494
After Repair Test - All Vehicles	0.15	81	762	0.63	86	2475
After Repair Test - Pass Vehicles	0.01	43	762	0.28	54	2461
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.61	211	763	1.84	195	2525
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.61	211	763	1.84	195	2525
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	0.0	100.0	0.0
TMG	0.0	100.0	0.0
A/F	55.6	22.2	22.2
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	0.0	100.0	0.0
EGR	11.1	88.9	0.0
ANY	66.7	100.0	22.2

Average Repair Costs

Parts Cost: $ 5.56 Labor Cost: $ 22.00

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
Totl	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
Pass	100.0	96.7	100.0	100.0	100.0	100.0	0.0	100.0	96.7	10.0	100.0	43.3	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	3.3	90.0	0.0	56.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	86.7	33.3	33.3	86.7
Fail	0.0	0.0	0.0	0.0
N/A	13.3	46.7	46.7	56.7

Record Counts

Test Records Processed:	207
Initial Test Records:	164
After Repair Test Records:	43
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	59579
Initial Test Vehicles:	59590
After Repair Test Vehicles:	59535
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	62.8	37.2	--	--	3.0	36.0	1.2	34.1	1.8	16.5	5.5
After Repair	91.2	26.5	14.7	8.8	0.0	100.0	0.0	100.0	0.0	66.7	33.3
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.22	79	864	1.02	82	2499
Initial Test - Pass Vehicles	0.03	29	867	0.32	43	2502
Initial Test - Fail Vehicles	0.55	162	858	2.19	146	2493
Initial Test - Underhood Fail Only	0.01	18	905	0.01	38	2450
Initial Test - Tailpipe Fail Only	0.59	169	858	2.22	146	2493
After Repair Test - All Vehicles	0.06	65	862	0.86	78	2502
After Repair Test - Pass Vehicles	0.03	34	858	0.40	46	2501
After Repair Test - Fail Vehicles	0.16	167	864	2.15	171	2493
After Repair Test - Inc. Repr. Vehicles	0.06	59	882	0.85	60	2470
After Repair Test - Waived Vehicles	0.09	80	895	1.66	125	2538
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.15	145	872	2.03	160	2504
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	44.2	44.2	11.6
TMG	44.2	53.5	2.3
A/F	48.8	37.2	14.0
CRK	20.9	76.7	2.3
EVP	16.3	81.4	2.3
EXH	32.6	62.8	4.7
EGR	18.6	79.1	2.3
ANY	95.3	81.4	25.6

Average Repair Costs

Parts Cost: $ 22.21 Labor Cost: $ 33.21

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pass	100.0	100.0	100.0	100.0	99.4	30.5	69.5	100.0	95.7	64.0	98.2	76.2	100.0
N/A	0.0	0.0	0.0	0.0	0.6	69.5	30.5	0.0	4.3	36.0	1.8	23.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	89.0	65.2	66.5	95.1
Fail	0.0	2.4	0.6	3.0
N/A	11.0	26.8	27.4	34.8

Record Counts

Test Records Processed:	201
Initial Test Records:	164
After Repair Test Records:	37
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	63472
Initial Test Vehicles:	62736
After Repair Test Vehicles:	66732
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	63.4	36.6	--	--	0.6	36.0	0.6	36.0	0.0	20.7	4.9
After Repair	86.7	23.3	0.0	13.3	0.0	100.0	0.0	100.0	0.0	75.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.14	52	881	1.02	36	2502
Initial Test - Pass Vehicles	0.01	21	884	0.52	20	2492
Initial Test - Fail Vehicles	0.36	105	877	1.90	62	2518
Initial Test - Underhood Fail Only	0.01	10	941	0.14	5	2458
Initial Test - Tailpipe Fail Only	0.37	107	875	1.93	63	2519
After Repair Test - All Vehicles	0.10	46	891	1.06	62	2489
After Repair Test - Pass Vehicles	0.08	37	893	0.48	26	2486
After Repair Test - Fail Vehicles	0.12	53	883	2.81	202	2523
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	0.16	89	898	1.75	55	2448
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.13	66	888	2.43	148	2496
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	18.9	75.7	5.4
TMG	16.2	83.8	0.0
A/F	51.4	43.2	5.4
CRK	0.0	100.0	0.0
EVP	0.0	100.0	0.0
EXH	16.2	73.0	10.8
EGR	2.7	97.3	0.0
ANY	81.1	100.0	16.2

Average Repair Costs

Parts Cost: $ 9.58 Labor Cost: $ 27.94

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.6
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.6
Pass	100.0	100.0	100.0	100.0	99.4	23.2	76.8	99.4	95.7	59.1	100.0	67.7	100.0
N/A	0.0	0.0	0.0	0.0	0.6	76.8	23.2	0.0	4.3	40.9	0.0	32.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	86.6	72.0	71.3	95.1
Fail	0.0	0.0	0.6	0.6
N/A	13.4	22.6	22.6	32.3

Record Counts

Test Records Processed:	571
Initial Test Records:	488
After Repair Test Records:	83
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	59993
Initial Test Vehicles:	59067
After Repair Test Vehicles:	65435
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	74.0	26.0	--	--	1.4	25.0	1.0	24.6	0.4	4.9	6.6
After Repair	88.4	20.3	14.5	11.6	12.5	100.0	0.0	87.5	12.5	25.0	25.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.35	72	883	0.69	48	2494
Initial Test - Pass Vehicles	0.09	26	884	0.33	24	2492
Initial Test - Fail Vehicles	1.06	202	880	1.70	115	2499
Initial Test - Underhood Fail Only	0.01	29	884	0.33	29	2422
Initial Test - Tailpipe Fail Only	1.11	209	881	1.73	117	2501
After Repair Test - All Vehicles	0.36	91	920	0.83	56	2472
After Repair Test - Pass Vehicles	0.20	56	919	0.58	39	2469
After Repair Test - Fail Vehicles	0.94	203	920	1.56	97	2491
After Repair Test - Inc. Repr. Vehicles	0.54	111	926	1.23	70	2444
After Repair Test - Waived Vehicles	0.58	158	927	1.49	112	2463
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	0.81	186	924	1.55	103	2484
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	30.1	59.0	10.8
TMG	31.3	68.7	0.0
A/F	48.2	36.1	15.7
CRK	4.8	95.2	0.0
EVP	4.8	95.2	0.0
EXH	28.9	68.7	2.4
EGR	10.8	89.2	0.0
ANY	91.6	97.6	25.3

Average Repair Costs

Parts Cost: $ 23.71 Labor Cost: $ 37.45

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.4
Miss	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.0	0.2	0.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0	1.0
Pass	100.0	99.8	100.0	99.8	99.8	22.5	77.3	99.6	99.0	78.3	98.4	69.7	100.0
N/A	0.0	0.0	0.0	0.0	0.0	77.5	22.7	0.0	1.0	21.7	1.6	30.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	90.2	66.8	65.6	94.7
Fail	0.2	0.4	1.0	1.2
N/A	9.6	28.7	29.3	34.6

All Other Smog Check Stations

Record Counts

Test Records Processed:	299
Initial Test Records:	202
After Repair Test Records:	97
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	62887
Initial Test Vehicles:	61524
After Repair Test Vehicles:	65725
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	37.6	62.4	--	--	5.4	61.9	0.5	56.9	5.0	28.2	4.5
After Repair	66.2	26.0	10.4	33.8	11.5	88.5	11.5	88.5	0.0	61.5	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.77	137	870	1.61	147	2491
Initial Test - Pass Vehicles	0.07	39	873	0.22	54	2476
Initial Test - Fail Vehicles	1.19	196	868	2.45	203	2501
Initial Test - Underhood Fail Only	1.20	129	866	1.04	74	2522
Initial Test - Tailpipe Fail Only	1.22	202	863	2.48	207	2501
After Repair Test - All Vehicles	0.28	85	880	1.21	106	2450
After Repair Test - Pass Vehicles	0.08	68	872	0.40	62	2440
After Repair Test - Fail Vehicles	0.28	87	868	2.24	164	2444
After Repair Test - Inc. Repr. Vehicles	0.14	209	867	0.92	109	2486
After Repair Test - Waived Vehicles	0.69	117	905	2.02	149	2473
After Repair Test - Underhood Fail Only	0.00	26	938	0.49	71	2379
After Repair Test - Tailpipe Fail Only	0.54	110	886	2.23	161	2466
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	30.9	62.9	6.2
TMG	40.2	59.8	0.0
A/F	45.4	20.6	34.0
CRK	10.3	89.7	0.0
EVP	11.3	88.7	0.0
EXH	12.4	87.6	0.0
EGR	8.2	88.7	3.1
ANY	82.5	93.8	38.1

Average Repair Costs

Parts Cost: $ 10.85 Labor Cost: $ 21.91

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Mod	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	1.5
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
Totl	0.0	0.5	0.0	1.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.5	2.5
Pass	100.0	99.5	100.0	99.0	100.0	100.0	0.0	99.5	95.5	9.9	95.0	63.9	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.5	90.1	5.0	35.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	65.3	40.1	39.6	77.7
Fail	0.0	3.0	3.0	5.0
N/A	34.7	30.2	30.7	57.4

CALIF TAS DATA (ALL OTHER STATIONS) - '81-'82 DODGE/PLYMOUTH 1.6 L 22-OCT-1987
CALIFORNIA I/M SUMMARY STATISTICS

Record Counts

Test Records Processed:	391
Initial Test Records:	277
After Repair Test Records:	111
Referee Test Records:	3

Average Odometer Readings

All Vehicles:	62249
Initial Test Vehicles:	61310
After Repair Test Vehicles:	64314
Referee Test Vehicles:	72467

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	46.2	53.8	--	--	2.9	53.4	0.4	50.9	2.5	23.5	4.0
After Repair	75.8	12.1	6.1	23.2	4.3	100.0	0.0	95.7	4.3	39.1	34.8
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.83	139	853	1.19	116	2499
Initial Test - Pass Vehicles	0.06	52	863	0.25	58	2493
Initial Test - Fail Vehicles	1.49	213	845	1.99	166	2505
Initial Test - Underhood Fail Only	0.00	23	907	0.01	23	2628
Initial Test - Tailpipe Fail Only	1.47	203	846	2.01	164	2502
After Repair Test - All Vehicles	0.41	88	859	0.82	86	2476
After Repair Test - Pass Vehicles	0.09	47	867	0.32	54	2473
After Repair Test - Fail Vehicles	1.00	144	818	2.83	174	2439
After Repair Test - Inc. Repr. Vehicles	0.66	112	890	1.38	111	2388
After Repair Test - Waived Vehicles	1.13	191	853	1.41	147	2510
After Repair Test - Underhood Fail Only	0.00	53	880	0.01	31	2368
After Repair Test - Tailpipe Fail Only	1.00	176	834	1.87	158	2482
Referee Test - All Vehicles	0.02	103	847	0.12	222	2496
Referee Test - Pass Vehicles	0.02	66	878	0.05	58	2510
Referee Test - Fail Vehicles	0.01	176	786	0.25	550	2468
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.01	176	786	0.25	550	2468

Repair Action Percentages

	Yes	No	Excd
MIS	27.9	63.1	9.0
TMG	40.5	59.5	0.0
A/F	65.8	16.2	18.0
CRK	14.4	85.6	0.0
EVP	9.9	89.2	0.9
EXH	10.8	86.5	2.7
EGR	9.0	90.1	0.9
ANY	81.1	92.8	27.9

Average Repair Costs

Parts Cost: $ 6.75 Labor Cost: $ 17.78

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Pass	100.0	99.3	100.0	100.0	100.0	100.0	0.0	100.0	96.0	8.3	94.9	70.8	100.0
N/A	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	4.0	91.7	5.1	29.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	64.3	51.3	50.5	81.9
Fail	0.0	0.7	1.4	2.2
N/A	35.7	24.9	24.9	50.5

Record Counts

Test Records Processed:	1706
Initial Test Records:	1268
After Repair Test Records:	436
Referee Test Records:	2

Average Odometer Readings

All Vehicles:	63084
Initial Test Vehicles:	62761
After Repair Test Vehicles:	63980
Referee Test Vehicles:	72900

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	55.7	44.3	--	--	2.3	43.5	0.8	42.0	1.5	18.2	5.6
After Repair	72.9	20.4	3.6	26.8	3.1	97.9	2.1	96.9	1.0	57.7	13.4
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.18	81	864	1.43	115	2513
Initial Test - Pass Vehicles	0.03	32	870	0.42	52	2510
Initial Test - Fail Vehicles	0.37	143	856	2.69	193	2517
Initial Test - Underhood Fail Only	0.02	57	814	0.65	80	2531
Initial Test - Tailpipe Fail Only	0.37	144	857	2.74	194	2515
After Repair Test - All Vehicles	0.18	77	877	1.08	93	2494
After Repair Test - Pass Vehicles	0.07	41	881	0.54	59	2489
After Repair Test - Fail Vehicles	0.32	157	864	1.89	177	2508
After Repair Test - Inc. Repr. Vehicles	0.07	57	873	0.83	56	2504
After Repair Test - Waived Vehicles	0.36	117	873	1.92	123	2495
After Repair Test - Underhood Fail Only	0.01	41	898	0.54	44	2449
After Repair Test - Tailpipe Fail Only	0.35	137	869	1.93	149	2503
Referee Test - All Vehicles	1.42	481	953	4.74	309	2582
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	1.42	481	953	4.74	309	2582
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.42	481	953	4.74	309	2582

Repair Action Percentages

	Yes	No	Excd
MIS	31.0	61.0	7.6
TMG	36.7	61.9	0.9
A/F	51.6	26.6	21.3
CRK	9.2	90.1	0.2
EVP	8.3	91.1	0.2
EXH	9.2	89.0	1.4
EGR	6.4	92.4	0.7
ANY	78.9	95.2	28.4

Average Repair Costs

Parts Cost: $ 6.84 Labor Cost: $ 18.90

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Mod	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Pass	100.0	100.0	100.0	99.6	99.8	31.5	68.5	100.0	98.3	61.9	96.7	70.3	100.0
N/A	0.0	0.0	0.0	0.1	0.2	68.5	31.5	0.0	1.7	38.1	3.3	29.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	79.3	57.3	58.1	88.6
Fail	1.2	1.0	0.2	2.1
N/A	19.6	21.6	21.6	36.7

Record Counts

Test Records Processed:	1850
Initial Test Records:	1428
After Repair Test Records:	421
Referee Test Records:	1

Average Odometer Readings

All Vehicles:	64888
Initial Test Vehicles:	64477
After Repair Test Vehicles:	66209
Referee Test Vehicles:	95400

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	59.4	40.6	--	--	3.9	39.1	1.5	36.7	2.4	24.3	2.0
After Repair	72.0	14.4	4.9	26.6	6.1	99.0	1.0	93.9	5.1	63.3	13.3

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.14	66	870	1.28	51	2514
Initial Test - Pass Vehicles	0.02	25	877	0.58	28	2507
Initial Test - Fail Vehicles	0.31	126	860	2.30	85	2523
Initial Test - Underhood Fail Only	0.02	20	864	0.65	22	2553
Initial Test - Tailpipe Fail Only	0.30	121	860	2.36	87	2522
After Repair Test - All Vehicles	0.11	62	885	1.18	50	2485
After Repair Test - Pass Vehicles	0.04	34	887	0.69	30	2487
After Repair Test - Fail Vehicles	0.29	124	860	2.32	87	2501
After Repair Test - Inc. Repr. Vehicles	0.08	60	896	1.38	43	2518
After Repair Test - Waived Vehicles	0.21	105	893	1.92	87	2471
After Repair Test - Underhood Fail Only	0.03	31	877	0.83	22	2499
After Repair Test - Tailpipe Fail Only	0.24	106	884	2.09	88	2480
Referee Test - All Vehicles	0.98	321	758	4.76	214	2344
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	0.98	321	758	4.76	214	2344
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.98	321	758	4.76	214	2344

Repair Action Percentages

	Yes	No	Excd
MIS	28.3	65.1	6.4
TMG	36.8	62.2	0.7
A/F	53.2	25.4	21.1
CRK	10.2	89.1	0.5
EVP	7.8	91.9	0.0
EXH	10.9	86.5	2.4
EGR	10.0	86.2	3.6
ANY	79.6	94.8	32.1

Average Repair Costs

Parts Cost: $ 10.82 Labor Cost: $ 21.93

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.4
Mod	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.3
Totl	0.0	0.4	0.1	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.8
Pass	99.9	99.5	99.9	99.6	99.9	32.6	67.3	99.9	98.2	63.5	96.3	71.9	100.0
N/A	0.1	0.1	0.0	0.2	0.1	67.4	32.6	0.0	1.8	36.5	3.7	28.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	85.6	60.2	59.9	93.1
Fail	1.4	1.1	1.3	3.4
N/A	13.0	18.3	18.3	28.0

Record Counts

Test Records Processed:	4482
Initial Test Records:	3514
After Repair Test Records:	955
Referee Test Records:	13

Average Odometer Readings

All Vehicles:	62912
Initial Test Vehicles:	61879
After Repair Test Vehicles:	66532
Referee Test Vehicles:	76200

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	66.1	33.9	--	--	3.9	32.0	1.9	30.0	2.0	5.9	6.6
After Repair	71.0	19.5	5.5	28.7	0.9	99.6	0.4	99.1	0.4	30.1	24.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.43	97	875	0.82	61	2505
Initial Test - Pass Vehicles	0.10	31	880	0.40	30	2503
Initial Test - Fail Vehicles	1.07	227	865	1.63	122	2508
Initial Test - Underhood Fail Only	0.07	31	876	0.38	30	2504
Initial Test - Tailpipe Fail Only	1.13	237	865	1.67	126	2508
After Repair Test - All Vehicles	0.44	107	897	1.00	75	2479
After Repair Test - Pass Vehicles	0.18	52	898	0.56	41	2478
After Repair Test - Fail Vehicles	0.95	206	890	1.73	142	2483
After Repair Test - Inc. Repr. Vehicles	0.39	113	890	1.09	64	2459
After Repair Test - Waived Vehicles	0.73	175	898	1.62	112	2479
After Repair Test - Underhood Fail Only	0.08	34	897	0.31	30	2564
After Repair Test - Tailpipe Fail Only	0.82	189	896	1.66	125	2482
Referee Test - All Vehicles	1.11	169	889	1.58	117	2500
Referee Test - Pass Vehicles	0.16	63	868	0.82	72	2524
Referee Test - Fail Vehicles	1.71	235	903	2.06	146	2484
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	1.68	253	899	2.29	166	2487

Repair Action Percentages

	Yes	No	Excd
MIS	29.2	58.3	12.3
TMG	34.2	64.8	0.7
A/F	53.0	24.8	22.0
CRK	6.9	92.5	0.4
EVP	6.3	93.5	0.0
EXH	9.2	89.0	1.6
EGR	6.7	91.4	1.7
ANY	80.5	96.3	33.1

Average Repair Costs

Parts Cost: $ 8.88 Labor Cost: $ 18.84

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.3	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.9
Mod	0.0	0.1	0.0	0.1	0.3	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.5
Miss	0.0	0.1	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.6
Totl	0.1	0.5	0.1	0.3	0.5	0.1	0.2	0.2	0.0	0.1	0.1	0.2	2.0
Pass	99.9	99.5	99.9	99.5	99.5	31.0	68.5	99.8	97.7	68.0	96.2	70.0	100.0
N/A	0.1	0.1	0.0	0.1	0.1	68.9	31.3	0.0	2.3	31.9	3.7	29.7	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	80.3	60.8	60.4	91.7
Fail	1.3	0.6	0.9	2.5
N/A	18.5	20.4	20.5	34.9

Appendix I

I/M Summary Statistics

1981 and Later Fleet and
EPA Pattern Failure Vehicles

All Smog Check Stations,
New Car Dealers, and
All Other Stations

Record Counts

Test Records Processed:	177174
Initial Test Records:	151338
After Repair Test Records:	25621
Referee Test Records:	215

Average Odometer Readings

All Vehicles:	44809
Initial Test Vehicles:	43410
After Repair Test Vehicles:	53044
Referee Test Vehicles:	47746

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.4	22.6	--	--	1.7	21.6	0.9	20.9	0.8	5.4	8.1
After Repair	76.0	22.6	5.8	23.1	4.0	97.8	2.2	96.0	1.7	31.7	34.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	73	830	0.51	55	2499
Initial Test - Pass Vehicles	0.07	30	830	0.16	28	2499
Initial Test - Fail Vehicles	1.27	220	832	1.70	146	2497
Initial Test - Underhood Fail Only	0.16	44	828	0.26	34	2497
Initial Test - Tailpipe Fail Only	1.29	223	833	1.74	148	2497
After Repair Test - All Vehicles	0.55	108	857	0.94	79	2486
After Repair Test - Pass Vehicles	0.20	53	856	0.36	43	2487
After Repair Test - Fail Vehicles	1.27	212	854	2.06	148	2485
After Repair Test - Inc. Repr. Vehicles	0.53	120	855	1.05	80	2488
After Repair Test - Waived Vehicles	1.01	190	866	1.76	132	2480
After Repair Test - Underhood Fail Only	0.10	38	829	0.20	30	2484
After Repair Test - Tailpipe Fail Only	1.15	203	861	1.93	141	2483
Referee Test - All Vehicles	1.64	243	846	1.57	163	2493
Referee Test - Pass Vehicles	0.99	102	835	0.62	87	2485
Referee Test - Fail Vehicles	2.11	347	854	2.26	219	2498
Referee Test - Underhood Fail Only	1.63	194	772	0.92	64	2393
Referee Test - Tailpipe Fail Only	1.89	337	870	2.42	202	2513

Repair Action Percentages

	Yes	No	Excd
MIS	30.5	59.1	10.2
TMG	32.3	66.9	0.6
A/F	51.9	29.2	18.7
CRK	7.8	91.5	0.4
EVP	6.8	92.8	0.2
EXH	10.1	88.2	1.5
EGR	7.2	90.6	2.0
ANY	79.5	95.7	29.0

Average Repair Costs

Parts Cost: $ 11.08 Labor Cost: $ 21.51

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.8
Pass	99.5	89.0	75.3	98.9	98.7	36.9	61.8	91.7	93.8	67.3	97.3	68.8	99.9
N/A	0.4	10.8	24.6	1.0	1.2	63.1	38.1	8.2	6.2	32.7	2.7	31.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	82.9	60.7	55.4	91.9
Fail	0.3	0.4	0.6	1.2
N/A	16.8	22.8	27.8	39.2

Record Counts

Test Records Processed:	33099
Initial Test Records:	29225
After Repair Test Records:	3874
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	36821
Initial Test Vehicles:	35798
After Repair Test Vehicles:	44541
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	81.7	18.3	--	--	0.6	18.0	0.3	17.7	0.3	4.5	7.1
After Repair	89.2	24.6	7.7	10.6	3.7	97.3	2.7	96.3	0.9	28.7	40.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.24	56	821	0.41	43	2498
Initial Test - Pass Vehicles	0.04	25	820	0.12	23	2498
Initial Test - Fail Vehicles	1.14	197	827	1.69	131	2495
Initial Test - Underhood Fail Only	0.08	36	821	0.19	23	2472
Initial Test - Tailpipe Fail Only	1.14	197	828	1.71	132	2495
After Repair Test - All Vehicles	0.34	77	843	0.64	57	2491
After Repair Test - Pass Vehicles	0.11	43	842	0.26	33	2490
After Repair Test - Fail Vehicles	0.92	165	841	1.64	125	2490
After Repair Test - Inc. Repr. Vehicles	0.39	111	849	0.90	64	2496
After Repair Test - Waived Vehicles	0.92	167	849	1.46	99	2495
After Repair Test - Underhood Fail Only	0.17	40	781	0.18	22	2499
After Repair Test - Tailpipe Fail Only	0.92	167	845	1.60	118	2492
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	33.1	60.7	6.1
TMG	29.6	69.9	0.5
A/F	59.1	30.4	10.4
CRK	7.6	91.9	0.4
EVP	7.3	92.5	0.2
EXH	15.7	82.0	2.3
EGR	8.3	90.7	1.0
ANY	89.1	95.3	18.4

Average Repair Costs

Parts Cost: $ 14.37 Labor Cost: $ 29.24

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Pass	99.6	88.2	72.9	99.8	99.7	28.5	71.1	92.0	95.8	78.7	98.6	66.7	100.0
N/A	0.4	11.7	27.0	0.2	0.3	71.4	28.8	8.0	4.2	21.3	1.4	33.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	87.3	64.3	58.3	94.3
Fail	0.1	0.1	0.3	0.4
N/A	12.7	27.4	33.2	41.0

Record Counts

Test Records Processed:	144075
Initial Test Records:	122113
After Repair Test Records:	21747
Referee Test Records:	215

Average Odometer Readings

All Vehicles:	46644
Initial Test Vehicles:	45232
After Repair Test Vehicles:	54559
Referee Test Vehicles:	47746

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	76.4	23.6	--	--	1.9	22.5	1.1	21.6	0.9	5.7	8.3
After Repair	73.6	22.2	5.5	25.3	4.0	97.8	2.2	96.0	1.8	31.9	33.5
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.37	77	832	0.53	58	2499
Initial Test - Pass Vehicles	0.08	31	832	0.17	29	2499
Initial Test - Fail Vehicles	1.29	224	833	1.70	149	2497
Initial Test - Underhood Fail Only	0.16	44	828	0.26	34	2499
Initial Test - Tailpipe Fail Only	1.32	228	834	1.75	151	2497
After Repair Test - All Vehicles	0.59	113	860	0.99	83	2485
After Repair Test - Pass Vehicles	0.22	55	859	0.38	45	2487
After Repair Test - Fail Vehicles	1.34	221	856	2.14	152	2485
After Repair Test - Inc. Repr. Vehicles	0.56	122	857	1.08	84	2486
After Repair Test - Waived Vehicles	1.01	192	867	1.79	134	2479
After Repair Test - Underhood Fail Only	0.10	38	831	0.20	31	2483
After Repair Test - Tailpipe Fail Only	1.18	208	863	1.97	144	2481
Referee Test - All Vehicles	1.64	243	846	1.57	163	2493
Referee Test - Pass Vehicles	0.99	102	835	0.62	87	2485
Referee Test - Fail Vehicles	2.11	347	854	2.26	219	2498
Referee Test - Underhood Fail Only	1.63	194	772	0.92	64	2393
Referee Test - Tailpipe Fail Only	1.89	337	870	2.42	202	2513

Repair Action Percentages

	Yes	No	Excd
MIS	30.1	58.8	10.9
TMG	32.8	66.4	0.6
A/F	50.6	29.0	20.2
CRK	7.9	91.4	0.5
EVP	6.7	92.8	0.2
EXH	9.1	89.3	1.4
EGR	7.0	90.6	2.2
ANY	77.8	95.8	30.9

Average Repair Costs

Parts Cost: $ 10.48 Labor Cost: $ 20.13

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.1	0.3	0.2	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.9
Pass	99.5	89.2	75.8	98.7	98.5	38.9	59.6	91.6	93.3	64.6	96.9	69.3	99.9
N/A	0.4	10.5	24.0	1.2	1.4	61.1	40.4	8.3	6.6	35.4	3.0	30.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	81.9	59.9	54.8	91.3
Fail	0.4	0.4	0.7	1.4
N/A	17.7	21.7	26.5	38.8

Record Counts

Test Records Processed:	15373
Initial Test Records:	12162
After Repair Test Records:	3194
Referee Test Records:	17

Average Odometer Readings

All Vehicles:	43787
Initial Test Vehicles:	42996
After Repair Test Vehicles:	46776
Referee Test Vehicles:	48553

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	64.5	35.5	--	--	1.7	34.7	0.8	33.8	0.8	8.2	14.2
After Repair	76.5	29.7	7.5	22.9	2.7	98.4	1.6	97.3	1.1	26.6	38.2
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.43	103	844	0.75	70	2501
Initial Test - Pass Vehicles	0.06	34	844	0.17	32	2505
Initial Test - Fail Vehicles	1.10	227	844	1.82	139	2495
Initial Test - Underhood Fail Only	0.10	43	835	0.19	36	2518
Initial Test - Tailpipe Fail Only	1.12	229	845	1.85	139	2494
After Repair Test - All Vehicles	0.51	110	856	1.02	77	2487
After Repair Test - Pass Vehicles	0.13	50	853	0.33	41	2490
After Repair Test - Fail Vehicles	1.14	198	850	2.29	132	2483
After Repair Test - Inc. Repr. Vehicles	0.44	126	865	1.32	84	2500
After Repair Test - Waived Vehicles	0.99	196	875	1.72	126	2480
After Repair Test - Underhood Fail Only	0.12	60	834	0.23	45	2493
After Repair Test - Tailpipe Fail Only	1.08	197	861	2.06	130	2482
Referee Test - All Vehicles	0.71	257	871	1.44	103	2533
Referee Test - Pass Vehicles	0.00	19	883	0.37	38	2477
Referee Test - Fail Vehicles	0.86	308	869	1.68	117	2545
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.68	316	876	1.66	113	2549

Repair Action Percentages

	Yes	No	Excd
MIS	32.3	56.7	11.0
TMG	33.3	66.2	0.5
A/F	47.6	33.8	18.5
CRK	7.8	92.0	0.2
EVP	6.9	92.9	0.3
EXH	9.6	88.9	1.4
EGR	6.9	91.8	1.4
ANY	79.0	96.5	28.9

Average Repair Costs

Parts Cost: $ 10.63 Labor Cost: $ 21.89

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.1	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.6
Pass	99.9	98.9	83.8	99.8	99.9	46.3	53.5	99.9	96.3	72.2	96.5	67.6	100.0
N/A	0.1	0.9	16.1	0.1	0.1	53.6	46.4	0.0	3.7	27.8	3.5	32.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	83.0	57.6	57.1	91.6
Fail	0.4	0.4	0.6	1.3
N/A	16.6	22.8	23.2	34.8

Record Counts

Test Records Processed:	3513
Initial Test Records:	2836
After Repair Test Records:	677
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	36575
Initial Test Vehicles:	36177
After Repair Test Vehicles:	38242
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	67.8	32.2	--	--	0.9	31.8	0.4	31.2	0.5	7.0	13.3
After Repair	88.8	30.4	10.6	11.2	0.0	100.0	0.0	100.0	0.0	13.8	43.1
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.36	92	837	0.70	62	2500
Initial Test - Pass Vehicles	0.06	32	838	0.16	29	2504
Initial Test - Fail Vehicles	0.99	218	835	1.82	130	2490
Initial Test - Underhood Fail Only	0.08	48	806	0.27	48	2494
Initial Test - Tailpipe Fail Only	0.98	214	835	1.83	127	2489
After Repair Test - All Vehicles	0.45	88	843	0.71	59	2493
After Repair Test - Pass Vehicles	0.10	45	843	0.28	35	2492
After Repair Test - Fail Vehicles	1.10	168	837	1.66	102	2492
After Repair Test - Inc. Repr. Vehicles	0.25	118	874	0.99	68	2501
After Repair Test - Waived Vehicles	1.44	216	855	1.53	127	2498
After Repair Test - Underhood Fail Only	0.01	29	736	0.01	29	2335
After Repair Test - Tailpipe Fail Only	1.20	181	843	1.63	109	2494
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	35.6	56.4	8.0
TMG	32.6	66.6	0.7
A/F	54.5	34.9	10.6
CRK	6.6	93.2	0.1
EVP	8.0	91.9	0.1
EXH	14.2	84.2	1.6
EGR	7.2	92.2	0.6
ANY	88.2	97.0	19.2

Average Repair Costs

Parts Cost: $ 12.24 Labor Cost: $ 27.86

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Mod	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Pass	99.9	99.5	76.4	99.9	99.9	35.3	64.5	99.9	95.0	84.5	98.4	66.2	100.0
N/A	0.1	0.4	23.4	0.1	0.0	64.6	35.5	0.0	5.0	15.5	1.6	33.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	86.0	59.6	58.3	92.9
Fail	0.2	0.1	0.4	0.6
N/A	13.8	31.1	32.1	39.5

Record Counts

Test Records Processed:	11860
Initial Test Records:	9326
After Repair Test Records:	2517
Referee Test Records:	17

Average Odometer Readings

All Vehicles:	45923
Initial Test Vehicles:	45069
After Repair Test Vehicles:	49071
Referee Test Vehicles:	48553

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	63.4	36.6	--	--	1.9	35.6	1.0	34.6	0.9	8.6	14.4
After Repair	73.2	29.5	6.7	26.0	3.0	98.2	1.8	97.0	1.2	28.1	37.6
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.45	106	846	0.77	73	2502
Initial Test - Pass Vehicles	0.06	35	845	0.17	33	2505
Initial Test - Fail Vehicles	1.13	229	847	1.81	141	2496
Initial Test - Underhood Fail Only	0.10	42	838	0.18	35	2521
Initial Test - Tailpipe Fail Only	1.16	233	847	1.86	143	2495
After Repair Test - All Vehicles	0.53	115	860	1.11	82	2485
After Repair Test - Pass Vehicles	0.14	52	856	0.34	43	2489
After Repair Test - Fail Vehicles	1.16	206	854	2.47	141	2480
After Repair Test - Inc. Repr. Vehicles	0.53	129	861	1.45	90	2500
After Repair Test - Waived Vehicles	0.94	193	877	1.75	126	2478
After Repair Test - Underhood Fail Only	0.13	62	837	0.24	46	2498
After Repair Test - Tailpipe Fail Only	1.05	200	865	2.15	134	2479
Referee Test - All Vehicles	0.71	257	871	1.44	103	2533
Referee Test - Pass Vehicles	0.00	19	883	0.37	38	2477
Referee Test - Fail Vehicles	0.86	308	869	1.68	117	2545
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	0.68	316	876	1.66	113	2549

Repair Action Percentages

	Yes	No	Excd
MIS	31.4	56.8	11.8
TMG	33.5	66.1	0.4
A/F	45.8	33.6	20.7
CRK	8.1	91.6	0.2
EVP	6.6	93.1	0.3
EXH	8.4	90.2	1.4
EGR	6.8	91.7	1.6
ANY	76.5	96.3	31.5

Average Repair Costs

Parts Cost: $ 10.19 Labor Cost: $ 20.26

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.3
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.0	0.2	0.2	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.1	0.7
Pass	99.9	98.7	86.0	99.8	99.9	49.7	50.2	99.8	96.6	68.4	95.9	68.0	100.0
N/A	0.1	1.1	13.8	0.1	0.1	50.2	49.8	0.0	3.3	31.6	4.1	31.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	82.1	57.1	56.8	91.2
Fail	0.5	0.5	0.7	1.5
N/A	17.4	20.3	20.4	33.3

sierra research

A Study of Excess Motor Vehicle Emissions – Causes and Control

Section IX

Statutory Changes to Implement Recommended Improvements in the California Smog Check Program

prepared for:

State of California
Air Resources Board

prepared by:

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SECTION IX

A STUDY OF EXCESS MOTOR VEHICLE EMISSIONS - CAUSES AND CONTROL

Statutory Changes to Implement Recommended Improvements in the California Smog Check Program

prepared for:

California Air Resources Board

December 1988

prepared by:

Sierra Research, Inc.
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PREFACE

This report was prepared in support of motor vehicle inspection and maintenance program legislation recommended by the California I/M Review Committee, of which ARB is a member. The proposed legislation contained in this report represents the I/M Review Committee's initial proposal. The proposal could be amended based on further analysis or discussions with the intended author of the bill and other interested parties. Once a bill is introduced, there may be numerous changes made during the course of legislative hearings.

A STUDY OF
EXCESS MOTOR VEHICLE EMISSIONS -
CAUSES AND CONTROL

Statutory Changes to Implement
Recommended Improvements in
the California Smog Check Program

Table of Contents

A STUDY OF
EXCESS MOTOR VEHICLE EMISSIONS -
CAUSES AND CONTROL

Statutory Changes to Implement
Recommended Improvements in
the California Smog Check Program

1. SUMMARY

In support of the California I/M Review Committee established under Senate Bill 33, Sierra Research has prepared a comprehensive revision to the statutes affecting the Smog Check program. Proposed statute revisions needed to implement the Committee's recommendations appear in the appendix. (Proposed deletions to current law are shown in underlined type and proposed additions are shown in CAPITALIZED TYPE.) Major elements of the proposal include:

1. reauthorization of the program on a permanent basis,
2. changing the vehicles subject to the program from those 20 years old or less to all 1966 and later models,
3. requirements for improved emissions analyzers,
4. increased repair cost ceilings ranging from $60-300, depending on the age of the vehicle,
5. substantial revisions to vehicle emissions warranties, and
6. reorganization of the Bureau of Automotive Repair into a Resources Agency department reporting through the Governor's Secretary for Environmental Affairs.

Based on Sierra's evaluation of the Smog Check program, each of these elements is important to the future success of the program. If enacted, these changes will more than double the emission reductions achieved.

Based on comments received during previous meetings of the I/M Review Committee and during previous legislative hearings on I/M bills, the positions that will probably be taken by various organizations and interest groups can be forecast with some precision. Table 1

summarizes the positions that are expected from several important participants in legislative hearings on the proposal.

Table 1

Expected Positions on Provisions of the Proposed Statutory Changes

	Provision	ARB & APCDs	Service Industry	Auto-makers	General Public
1.	Reauthorization	support	support	neutral	mixed
2.	1966 and Later Models	support	support	neutral	mixed
3.	New Analyzers	support	mixed	neutral	neutral
4.	Increased Cost Ceilings	support	support	neutral	mixed
5.	10/100,000 Warranty	support	mixed	opposed	support
6.	Transfer of BAR	support	opposed	neutral	neutral
	OVERALL POSITION IN UP-OR-DOWN VOTE	SUPPORT	SUPPORT	OPPOSED	SUPPORT

As indicated in the above table, Sierra's forecast regarding the expected positions on the proposed statutory changes is generally positive. However, legislation changes are not decided on a simple up-or-down vote on a bill. There is either opposition or a "mixed" reaction expected from at least one group to each of the six major provisions of the proposal.

The nature of the opposition expected to each major provision of the proposal is outlined below. In the first three areas, Sierra does not believe the opposition has a 50% probability of causing a significant compromise to be enacted.

1. Reauthorization - The Automobile Club of Southern California is expected to oppose the concept of continuing a periodic vehicle inspection and maintenance program. It appears that the Auto Club will endorse an alternative concept under which there would be greater reliance on recalls supplemented by "randomly" performed inspections each time a vehicle receives engine-related service. In Sierra's opinion, the Auto Club will fail to convince the Legislature that an alternative concept should be pursued.

2. 1966 and Later Models - There are two different sources of possible opposition to this provision. Members concerned about the economic impact of the Smog Check program on low-income citizens may prefer to continue exempting vehicles from the program that are more than 20 years old. Representatives of car clubs, to the extent that they participate in the process, will oppose the change because it will adversely affect their ability to modify (i.e., tamper with) the emission control systems on models popularly used as "hot rods". In general, the Legislature is not expected to be very sympathetic to the position of the views of "hot rodders". The Legislature will be concerned about the impact of the program on low-income citizens; however, the maximum recommended repair cost ceiling of $60 for pre-1972 models is likely to minimize the concern about including older vehicles in the program.

3. New Analyzers - As shown in Table 1, a "mixed" reaction is expected from the automotive service industry to the proposed requirement for all-new Test Analyzer Systems (TASs) to be used in the Smog Check Program. There will be support for the proposal from some TAS vendors who see the potential for increased sales, but there may be opposition from other vendors who believe they do not have the economic or technical resources to design a competitive product. Many garage owners will object to having to purchase a new TAS; however, organizations representing garage owners who have monitored the evaluation of the Smog Check program by the I/M Review Committee seem to recognize the value of new analyzers and apparently will not oppose the requirement. Sierra believes the opposition to this element of the proposal is unlikely to be effective in changing the proposed new requirement.

The key areas for potential problems are associated with the last three major changes:

4. Increased Cost Ceilings - Members who are concerned about the economic impact of the Smog Check program on low-income citizens will be concerned about increasing the maximum repair cost from $50 to a range of $60-300. The maximum recommended repair cost ceiling of $60 for pre-1972 models is likely to minimize the concern about higher cost ceilings; however, very old cars will eventually be covered by much higher repair cost ceilings. ARB and the Review Committee will need to point out that the new 10-year/ 100,000 mile warranty proposal will be an offsetting benefit to low-income motorists who would otherwise be charged the full cost for repair of extremely expensive electronic components needed to keep the vehicle running.

5. 10/100,000 Warranty - At this writing, the California Automotive Service Councils (ASC) is officially "neutral" on the proposed new warranty. ASC believes that with the proposed shortening of the "full-coverage" warranty, the $300 "deductible" level for an extended warranty, and the increased clarity of the warranty provisions, there will be a net increase in the amount of repair work that can be performed by independent garages. However, other representatives of the auto service industry may be more focussed on the federal warranty policy, where there may be greater potential for rolling back the current warranty protection. Because of the impact that a new California warranty might have at the federal level, support for extending the duration of any coverage beyond the current 5-year/50,000 mile level is likely to be opposed. More importantly, new vehicle manufacturers can be expected to oppose the concept of extending their warranty obligations for expensive components. How effective their opposition will be depends on how concerned their dealers become about the impact of extended warranties on new car prices and sales.

6. Transfer of BAR - Opponents to the proposed reorganization of BAR will probably include the Department of Consumer Affairs and its parent agency (where BAR is currently located). Although BAR is only a bureau within the Department of Consumer Affairs, it is as large as some departments. More significantly, BAR generates very high revenues through the sale of certificates (currently $5 for every vehicle passing a Smog Check). Transfer of BAR would result in a significant loss of program responsibility and funding for the Department of Consumer Affairs. There is also likely to be opposition to the transfer of BAR from some representatives of the automotive service industry. Initially, the perception was created that BAR would be controlled by ARB under the proposed reorganization. Some representatives of the service industry view ARB as an organization that is difficult to work with. (Much of this perception seems to be associated with ARB's interest in longer emissions warranties which the service industry believes are adverse to its interest.) As the result of negotiations with certain service industry representatives regarding the proposed new emissions warranty, and due to language which clarifies that BAR would be headed by a department director appointed by the Governor, opposition to the proposed reorganization may have been reduced somewhat.

One other area of potential controversy involves a provision which is not included in the proposal. Several members of the California I/M Review Committee are in support of a provision that would give local districts the authority to require the inspection frequency to be increased from biennial to annual. Some representatives of the

automotive service industry may also prefer annual inspection frequency. In contrast, members of the Legislature that are concerned about the effect of the program on low-income vehicle owners could oppose an increase in inspection frequency.

The ultimate fate of the proposed legislation will depend on the effectiveness with which the supporting and opposing arguments for each provision are put forth.

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2. INTRODUCTION

The development of statutory changes to improve the California Smog Check Program was Task Number 8 of the Scope of Work under a contract with the California Air Resources Board for "A Study of Excess Motor Vehicle Emissions - Causes and Control" (ARB Contract No. A5-188-32). The principal objectives of the task were 1) to draft language to implement all of the program improvements recommended by the California I/M Review Committee through a comprehensive set of revisions to Senate Bill 33 (SB 33) and other statutes affecting the program, and 2) to prepare an explanation for each of the changes. In explaining each of the changes, Sierra was also directed to outline the opposing arguments that may be raised when the proposed legislation is debated by the Legislature.

Initially, this task was to involve the development of both regulatory and statutory changes. However, the I/M Review Committee decided to incorporate into statute most of the recommended changes that could have been accomplished through regulatory action. Additional recommended changes that are still proposed for implementation through regulatory action are addressed in a separate report dealing with proposed changes to Test Analyzer Systems.

Following this introductory section, Section 3 explains each specific change that has been proposed and outlines the possible arguments that may be used to oppose the recommended changes. The appendix to the report contains an amended version of each of the statutory provisions affected by the proposed revisions.

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3. DISCUSSION OF PROPOSED CHANGES

1.* The Bureau of Automotive Repair is reorganized into a Resources Agency department reporting through the Governor's Secretary for Environmental Affairs.

Although the exclusive purpose of the Smog Check program is air pollution control, the program currently suffers from a lack of focus on pollution control issues by the agency and department where BAR is presently located. Under the current organizational structure, there is a reluctance to pursue program changes that are likely to increase the complexity or difficulty of program management. Increased emissions control is not considered a benefit that offsets such increases in BAR responsibility. In addition, conflicting legal opinions regarding the interpretation of vehicle emissions control related statutes and inadequate coordination of research and development activities would be minimized by organizational changes to facilitate greater cooperation between BAR and the ARB. Although the Review Committee believes BAR should retain independence from ARB, the current organizational placement of BAR is not in the best interest of the program. The BAR staff is made up of capable and dedicated individuals who will be fully able to improve the program if they can function in an atmosphere where the focus is on program effectiveness rather than minimized risk and responsibility. Sierra believes the reorganization of BAR is one of the most important recommendations being made.

Possible Opposition - Opponents to the proposed reorganization of BAR will probably include the Department of Consumer Affairs and its parent agency (where BAR is currently located). Although BAR is only a bureau within the Department of Consumer Affairs, it is as large as some departments. More significantly, BAR generates very high revenues through the sale of certificates (currently $5 for every vehicle passing a Smog Check). Transfer of BAR would result in a significant loss of program responsibility and funding for the Department of Consumer Affairs.

There is also likely to be opposition to the transfer of BAR from some representatives of the automotive service industry. Initially, the perception was created that BAR would be controlled by ARB under the proposed reorganization. Some representatives of the service industry view ARB as an

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* Numbers appearing in the left margin of the Appendix refer to the number of each change listed herein.

organization that is difficult to work with. (Much of this perception seems to be associated with ARB's interest in longer emissions warranties which the service industry believes are adverse to its interest.) As the result of negotiations with certain service industry representatives regarding the proposed new emissions warranty, and due to language which clarifies that BAR would be headed by a department director appointed by the Governor, opposition to the proposed reorganization may have been reduced somewhat.

2. Medium-Duty Vehicles are defined in statute for the first time.

This is an overdue technical amendment that reflects the existence of the medium-duty vehicle classification under ARB regulations. There is unlikely to be any opposition to this proposal.

3. Beginning with the 1990 model year, the 5-year/50,000 mile comprehensive emissions warranty is replaced with a 3-year/50,000 mile "full coverage" warranty and a 10-year/100,000 mile warranty with a $300 "deductible".

Many emissions control-related components on new, computer-controlled vehicles are very expensive to replace and when they fail, emissions can increase tenfold. Although failure rates for expensive systems like electronic control units and catalysts are not expected to be high, the emissions impact is so dramatic that failure in only 5% of the vehicle population can cause the average emissions of the population to double. The repair cost ceiling under the Smog Check program would have to be increased to approximately $1,000 to ensure the repair of such components. Alternatively, 5% of vehicles experiencing $1,000 repair costs could be repaired under an extended warranty, with a $300 deductible, that would increase the cost of new cars by only $35. The Review Committee and ARB have agreed to cut back the "full coverage" warranty from 5 years to 3 years in order to obtain service industry support for this significant new warranty coverage for the failure of expensive components. ARB and the Review Committee are very close to a compromise with the California Automotive Service Councils (ASC) on the warranty proposal.

Possible Opposition - Originally, the I/M Review Committee had proposed extending the 5/50 warranty to 10/100 on parts costing more than $200 to replace. This proposal met with strong opposition from representatives of the automotive service industry and vehicle manufacturers. Working with representatives of the ASC, a compromise proposal was developed under which the 5/50 warranty would be reduced to 3/50 and a "deductible" warranty would apply for 10 years or 100,000 miles. As drafted, ASC is neutral on the warranty proposal. They would apparently

support the language if the 3-year period for the full-coverage warranty is further reduced. Other automotive service organizations may still oppose the proposal. It is also likely that vehicle manufacturers will oppose the proposal because it extends the period of time that they maintain responsibility for the performance of major emissions control system components. How effective their opposition will be depends on how concerned their dealers become about the impact of extended warranties on new car prices and sales.

4. Vehicle manufacturers are required to determine the extent to which emissions-related defects exist in cars they produce and to recommend diagnostic and repair procedures that will identify and correct such defects.

Vehicle manufacturers are in the best position to identify the existence of defects in their vehicles through the information they obtain from warranty claims. (The I/M test itself can only identify some of the vehicles with excess emissions.) As the designers of the vehicles, the manufacturers are also in the best position to recommend ways to identify and correct such defects. Requiring their cooperation in the I/M program is sure to lead to increased efficiency in the identification and correction of defective vehicles.

Possible Opposition - It is possible that this proposal will be opposed by vehicle manufacturers, but the extent of that opposition will probably be related to obtaining assurances that ARB would not be able to require vehicle testing under the proposed language. If possible, the language should preserve ARB's ability to require vehicle testing if alternative means do not prove effective.

5. The Smog Check Program is extended indefinitely and a new performance target of a 25% reduction in HC and CO emissions is established for the I/M program. BAR is required to take all steps necessary to achieve this target.

As stated in the proposed new section regarding Legislative findings and declarations, "...air pollution problems in many areas of the state are of such severity and persistence that all reasonable air pollution control measures will be required for the indefinite future." It is therefore proposed that the January 1, 1990 "sunset" provision of the current law be eliminated and the Smog Check program continued indefinitely.

The Committee's study has shown that the emission reductions achievable through the I/M program can be more than doubled. Twenty-five percent reduction in HC and CO should be achievable within two program cycles.

Possible Opposition - The Automobile Club of Southern California is expected to oppose the concept of continuing a periodic vehicle inspection and maintenance program. It appears that the Auto Club will endorse an alternative concept under which there would be greater reliance on recalls, supplemented by "randomly" performed inspections each time a vehicle receives engine-related service. In Sierra's opinion, the Auto Club will fail to convince the Legislature that an alternative concept should be pursued. However, some members of the Legislature may feel more comfortable with a new sunset date being incorporated. It is unlikely that there will be any opposition to the proposed 25% performance target, in Sierra's opinion.

6. The number of areas in which I/M can be implemented is expanded to any area which contributes to violations of ambient air quality standards. In addition, ARB is given the authority to require I/M in districts that do not request the program if, in consultation with other districts, it is determined that I/M is needed to address ambient air quality standard violations in "downwind" areas. The NOx testing option is also subject to review by ARB in consultation with the districts.

The overwhelming majority of the members of the Review Committee believe it is important for ARB and the districts to be able to expand the program where it is clearly needed to reduce air quality standard violations. In addition, the Committee believes that ARB and the districts should be able to add NOx testing when such testing is available and necessary for an attainment strategy.

Possible Opposition - One member of the Review Committee (Jim Koslow, representing Yolo-Solano APCD) was opposed to the proposed language on the grounds that local officials would object to the possibility of ARB mandating an expansion of the program area. Concerns were also expressed by representatives of the Bay Area Air Quality Management District (BAAQMD) that ARB might mandate NOx controls in upwind areas where there is no ozone benefit, in order to reduce NOx in downwind areas. Theoretically, this could delay attainment of the ozone standard in the San Francisco area. However, upwind NOx controls could also prove necessary to attainment of the ozone standard in downwind areas.

7. "Test Only" stations are eliminated to simplify the program and ensure that motorists can have repairs performed without multiple trips to I/M stations.

Less than 1% of the garages participating in the program are "Test Only" stations now. All I/M Review Committee members support the elimination of this category. When "Test Only" stations are eliminated, there will also be no need to have two

different classifications of mechanics (i.e., test mechanics and repair mechanics). Throughout the new bill, all stations are now referred to as "Test and Repair" stations and all mechanics are referred to as "Test and Repair" mechanics.

Possible Opposition - Obviously, individuals who currently operate "Test Only" stations will be opposed to the proposed change. However, the automotive service organizations who are most active in the legislative process do not appear to oppose this change.

8. The exemptions for vehicles garaged outside the program area, heavy-duty vehicles, and LPG-powered vehicles are eliminated.

Vehicles garaged outside of an I/M area in which they are registered are most likely contributing to air pollution problems somewhere in the state. The same is true for LPG-powered and heavy-duty gasoline vehicles. ARB studies indicate that it is now feasible to include these vehicles in the program.

Possible Opposition - One possible source of opposition to this proposal could be members of the Legislature or other influential individuals who are currently exempt from the program because they own vehicles that are not garaged in the area that they are registered. However, organized opposition to the elimination of the exemption for vehicles garaged outside the area in which they are registered does not appear likely. Opposition to the elimination of exemptions for heavy-duty vehicles could conceivably come from the California Trucking Association based on the argument that truckers maintain their vehicles well and I/M isn't needed. However, available data will support an argument against elimination of the heavy-duty exemption and opposition may not surface.

9. The class of vehicles subject to the program is changed from those 20 years old or less to all 1966 and later models.

The Review Committee's study shows that the emissions from vehicles more than 20 years old are so high that their inclusion in the program is important even though their numbers are relatively small. In addition, the Committee's study showed that these vehicles can achieve very large emission reductions at relatively low cost. 1966 was selected as the cutoff point because this is the first model year when exhaust emission control devices were required.

Possible Opposition - Members of the Legislature that are most concerned about the impact of the program on low-income motorists may oppose this suggested change. Hopefully, opposition will be minimized by the fact that the repair cost ceiling for the oldest vehicles is proposed to be increased only to $60. In addition,

the oldest vehicles are the ones most likely to realize fuel economy benefits as the result of Smog Check repairs.

10. "Self exemption" from the program is eliminated. All motorists seeking exemptions are required to go to BAR or a Referee facility.

Under the current program, vehicle owners are able to exempt themselves from the program by simply checking a box indicating that they own an exempt vehicle (e.g., a Diesel). The abuse potential associated with this approach is unacceptable, in the opinion of the Committee.

Possible Opposition - As with the proposed elimination of the exemption for vehicles garaged outside the area they are registered in, one possible source of opposition to this proposal could be members of the Legislature or other influential individuals who are currently able to use the "self-exemption". Organized opposition does not appear likely.

11. A "Multiple Tier" system of mechanic qualification is authorized in order to establish more rigorous qualification criteria for mechanics who work on the most complicated emission control systems.

The Committee's study showed that more than half of all mechanics participating in the program lack the skills necessary to effectively test and repair computer-controlled vehicles. However, most mechanics are capable of doing a good job on vehicles equipped with more conventional technology. In order to maximize both the opportunity for participation in the program and the effectiveness of the program, more than one class of mechanics is needed.

Possible Opposition - Based on discussions with representatives of the service industry, there will be no organized opposition to this proposal.

12. BAR is given the flexibility to use state employees, instead of contractors, for quality assurance and referee functions.

The Committee believes BAR should have the option of using state employees for certain program functions which are now reserved for contractors. This could potentially improve the cost-effectiveness of the program in the future. Even if contractors continue to be used, the possibility of state operation of quality audit functions provides an incentive for maximum contractor performance and minimum cost.

Possible Opposition - The only expected opposition to this proposal is from BAR's current contractors or other organizations intending to compete for referee or quality assurance contracts in the future. Companies who could be opposed to the concept include Systems Control (SCI), Engineering Science, and Hamilton Test Systems.

13. Only BAR or a Referee facility should be able to issue waivers.

The Committee is convinced that the ability of I/M stations to issue waivers has significantly reduced the emission reduction benefits achievable under the program. The Committee's study showed that many vehicles receiving waivers could have been better repaired, even under the $50 repair cost ceiling. When the repair cost ceilings are revised upwards, there will seldom be a need for any vehicle to receive a waiver and there is no need for I/M stations to continue to be able to issue them.

Possible Opposition - In general, the automotive service industry would prefer to be able to continue issuing waivers to vehicles that cannot be made to pass the test within the repair cost ceiling. However, with the higher repair cost ceilings included in the proposal, organized opposition to the elimination of waivers at Smog Check stations is not expected.

14. Reference to "low emissions service and adjustment" is eliminated.

"Low emissions service and adjustment" is an approach that is primarily used with vehicles that were not factory-equipped with emissions control systems. Since these vehicles will no longer be subject to the program, the term can be eliminated. No opposition is expected.

15. The repair cost ceiling is increased from $50 to a range of $60-$300 depending on vehicle age.

The Committee's evaluation of the program clearly showed that the $50 repair cost ceiling is grossly inadequate to deal with the type of defects that cause excess emissions on late model cars and trucks. For 1980 and later models, 34% of the defects causing excess emissions cannot be repaired under the current cost ceiling. When adjusted for inflation to $60, the $50 limit is adequate for pre-1972 model year vehicles. However, newer vehicles need progressively higher repair cost ceilings to cover the cost of repairing commonly occurring defects. For 1972-1974 models the ceiling should be $125 to provide for more effective repair of air injection and EGR systems. For 1975-1979 models, more sophisticated air injection and EGR systems require a $175 cost ceiling. For 1980 and later models, a $250 limit is needed

to ensure coverage of critical electronic sensors. Even under these limits, about 16% of the defects occurring in 1980 and later model vehicles could not be fixed. Starting with the 1990 model year, a $300 repair cost ceiling in conjunction with a 10-year/100,000 mile/$300 deductible warranty, would ensure that all defects could be corrected.

Possible Opposition - Undoubtedly, this will be one of the most controversial elements of the proposed legislation. However, with the possible exception of AAA, there may not be organized opposition. The most significant issue will be the expected impact on the individual constituents of legislators. Members of the Legislature will have to balance their interest in improving air quality with a possible increase in the number of complaints they receive about the program.

16. Certificates of Compliance produced by Test Analyzer Systems are required for government-owned vehicles.

The new Test Analyzer System required in the bill will be a major contribution to the effective diagnosis and repair of emissions defects. The Committee believes that the operators of government fleet vehicles should be required to demonstrate that vehicles are being properly maintained by using the same test equipment as required for privately owned vehicles.

Possible Opposition - Representatives of local governments may oppose this proposal. In addition, it may be argued that increased cost will result. In response to the cost argument, the point can be made that previous studies have shown the air pollution control program to be "cost-effective", i.e., there are more economic benefits to the control of pollution than there are economic costs.

17. The I/M Review Committee's responsibilities are modified to maintain consistency with other program changes.

To help ensure the future success of the program, it is recommended that a Review Committee made up of representatives from each district be continued in existence and assigned the responsibility for evaluating the new program in a manner similar to the way it evaluated the current program. The Committee has considered whether its membership should be expanded to include other parties and concluded that the purpose of the Committee is best served by having the exclusive focus on program performance. This focus is best ensured by the current membership structure. Opposition to this proposal is not anticipated.

18. Requirements for BAR to administer training courses are deleted.

The Committee believes that it is not efficient for BAR's limited resources to be used for the administration of training courses when educational institutions are available to perform that function. So long as BAR retains the authority to certify institutions and instructors, there is no disadvantage to getting BAR out of the role of training administration.

Possible Opposition - Training costs to mechanics and garage owners could be higher if BAR does not administer training courses; however, organized opposition to this proposed change has not surfaced during meetings of the I/M Review Committee.

19. An apparently unintentional prohibition on the repair of emission control systems by other than qualified mechanics is eliminated.

Repair of emissions control systems by persons who are not qualified I/M mechanics should be prohibited only when such repairs are performed in order to satisfy the requirements of the I/M program. No opposition to this proposed change is expected.

20. Requirements are added for the use of improved Test Analyzer Systems.

Although the "BAR '84" analyzers now used in I/M stations have assisted in the accurate inspection of motor vehicles, the quality of inspections could be improved significantly through the use of analyzers capable of storing more information about various makes and models of vehicles. Enforcement of program requirements could also be improved if more information is recorded for each inspected vehicle. Supplemental diagnostic procedures could also be incorporated into a new analyzer design. Because of the continuous advances in technology, it is also important for BAR to have the authority to require TAS system upgrades on a periodic basis.

Possible Opposition - Since a TAS costs approximately $10,000, it might be expected that there will be some service industry opposition to a requirement for a new analyzer. However, representatives of the service industry who have monitored the meetings of the I/M Review Committee seem to recognize the need for an enhanced analyzer. As a result, we do not expect the opposition to this proposal to be very strong or very organized. There will be support for the proposal from some TAS vendors who see the potential for increased sales, however there may be opposition from other vendors who believe they do not have the economic or technical resources to design a competitive product. This is an issue that affects more than the California market because California has historically influenced analyzer decisions

made in other states. If a company cannot compete in California, it will have a much more limited market nationwide.

21. Bar Code is added to certificates of compliance.

Under the current program, there is no efficient means of cross checking the certificates of compliance received by DMV with those which are sold by BAR and the Smog Check stations. Counterfeiting and illegal transfers of certificates are harder to detect. With bar code added to the certificates, DMV counter personnel could use a bar code wand to read the number of each certificate into a computerized data file. This would significantly improve the ability to track certificates through the system.

Possible Opposition - DMV would incur some increase in cost associated with this proposal and could therefore be concerned about this provision of the bill.

22. Provisions are added for adjusting the price of certificates based on changes in the Consumer Price Index.

The effectiveness and fairness of the program will always be directly related to having adequate resources dedicated to enforcement, quality assurance, consumer complaint handling, and referee functions. The Committee believes BAR should be able to run a successful program with a certificate charge of $6, but inflation will eventually erode the six dollar limit to an inadequate amount unless BAR can adjust it to account for the effects of inflation.

Possible Opposition - Members of the Legislature who are concerned about the economic costs of the program may oppose delegating the authority to adjust fees as a means of minimizing program costs.

23. Sections of the Business and Professions Code dealing with the change-of-ownership inspection requirements in non-I/M areas are modified so that the change of ownership requirements are identical to the inspection and repair requirements under the I/M program.

In areas of the state where there is no I/M program, inspections of emission control systems are still required upon change of ownership. However, the inspection procedures have never been made consistent with those developed for the Smog Check program. Because the Smog Check program inspection and repair procedures are clearly superior, all inspections in non-I/M areas should be done using the same procedures. In addition, the qualifications for stations and mechanics participating in the change-of-

ownership inspections in non-I/M areas should be the same as those used in the Smog Check program.

Possible Opposition - The most significant impact of this provision is that many more garages would be required to purchase Test Analyzer Systems in order to continue participating in the change-of-ownership inspection required in non-I/M areas. Some opposition from garage owners is therefore expected.

24. References in the statutes to the "centralized" I/M program operated in the South Coast Air Basin between 1979 and 1984 are deleted.

There are several references in the Business and Professions Code and the Vehicle Code to the contractor-operated I/M program that existed in the Los Angeles area from 1979 to 1984. All provisions of the law referring to the old program need to be eliminated or modified to reflect the fact that it is no longer in existence. No opposition is expected to this proposed change.

25. Vehicle Code requirements regarding the need for a certificate of compliance to be obtained upon change of ownership are amended to make it clear that it is the seller's responsibility to obtain the certificate.

Except for sales to dealers (where expert knowledge can be assumed), it is more reasonable to impose the requirement for obtaining a certificate of compliance on the seller of the vehicle than the buyer. The seller is certainly more likely to be responsible for any tampering or defects which exist and should therefore be the party required to bring the vehicle into compliance. Since this is really a clarification of the current law, no significant opposition is expected.

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Appendix

PROPOSED STATUTE CHANGES

(Proposed deletions to current law
are shown in underlined type
and proposed additions
are shown in CAPITALIZED TYPE.)

STATUTE CHANGES PREPARED BY SIERRA
FOR THE I/M REVIEW COMMITTEE*

December 14, 1987

HEALTH AND SAFETY CODE
DIVISIONS 26. AIR RESOURCES

PART 1. GENERAL PROVISIONS AND DEFINITIONS

1 39024.5 "Department" means the Department of VEHICLE INSPECTION AND REPAIR Consumer Affairs.

2 39033.1 "MEDIUM-DUTY VEHICLE" MEANS A HEAVY-DUTY VEHICLE HAVING A MANUFACTURER'S MAXIMUM GROSS VEHICLE WEIGHT RATING UNDER A LIMIT ESTABLISHED BY THE STATE BOARD.

39511. (a) The Governor shall appoint the chairperson, who shall serve at the pleasure of the Governor, from among the members of the state board, and shall serve as the principal advisor to the Governor on, and shall assist the Governor in establishing, major policy and program matters on environmental protection. The chairperson shall also serve as the principal communications link for the effective transmission of policy problems and decisions to the Governor relating to the activities of the State Water Resources Control Board, and the
1 State Waste Management Board, AND THE DEPARTMENT OF VEHICLE INSPECTION AND REPAIR, in addition to serving as the Governor's chief air quality policy spokesperson.

PART 5. VEHICULAR AIR POLLUTION CONTROL

Chapter 2. New Motor Vehicles

Article 2. Manufacturers and Dealers

43204 (a) The manufacturer of each motor vehicle and motor vehicle engine MANUFACTURED PRIOR TO THE 1990 MODEL YEAR shall warrant to the

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* Numbers in the left margin refer to the explanations of the proposed changes contained in Section 3 of this report.

ultimate purchaser and each subsequent purchaser that the motor vehicle or motor vehicle engine is:

(1) Designed, built, and equipped so as to conform, at the time of sale, with the applicable emission standards specified in this part.

(2) Free from defects in materials and workmanship which cause such motor vehicle or motor vehicle engine to fail to conform with applicable regulations for its useful life as determined pursuant to subdivision (b).

43205 (A) COMMENCING WITH THE 1990 MODEL YEAR, THE MANUFACTURER OF EACH LIGHT-DUTY AND MEDIUM-DUTY MOTOR VEHICLE AND MOTOR VEHICLE ENGINE SHALL WARRANT TO THE ULTIMATE PURCHASER AND EACH SUBSEQUENT PURCHASER THAT THE MOTOR VEHICLE OR MOTOR VEHICLE ENGINE IS:

(1) DESIGNED, BUILT, AND EQUIPPED SO AS TO CONFORM WITH THE APPLICABLE EMISSION STANDARDS SPECIFIED IN THIS PART FOR A PERIOD OF USE OF FIVE YEARS OR 50,000 MILES, WHICHEVER FIRST OCCURS.

(2) FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP WHICH COULD CAUSE SUCH MOTOR VEHICLE OR MOTOR VEHICLE ENGINE TO FAIL TO CONFORM WITH APPLICABLE EMISSION STANDARDS SPECIFIED IN THIS PART OR TO FAIL TO PASS A TEST ESTABLISHED UNDER SECTION 44012 OF THIS PART FOR THREE YEARS OR 50,000 MILES, WHICHEVER FIRST OCCURS.

(3) FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP WHICH COULD CAUSE SUCH MOTOR VEHICLE OR MOTOR VEHICLE ENGINE TO FAIL TO PASS A TEST ESTABLISHED UNDER SECTION 44012 OF THIS PART AND WHICH COST MORE THAN $300 TO REPAIR FOR A PERIOD OF TEN YEARS OR 100,000 MILES, WHICHEVER FIRST OCCURS. 3

(B) COMMENCING WITH THE 1990 MODEL YEAR, THE MANUFACTURERS OF EACH MOTOR VEHICLE AND MOTOR VEHICLE ENGINE OTHER THAN A LIGHT-DUTY OR MEDIUM-DUTY MOTOR VEHICLE OR MOTOR VEHICLE ENGINE SHALL WARRANT TO THE ULTIMATE PURCHASER AND EACH SUBSEQUENT PURCHASER THAT THE MOTOR VEHICLE OR MOTOR VEHICLE ENGINE IS:

(1) DESIGNED, BUILT, AND EQUIPPED SO AS TO CONFORM WITH THE APPLICABLE EMISSION STANDARDS SPECIFIED IN THIS PART FOR A PERIOD OF USE DETERMINED BY THE STATE BOARD.

(2) FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP WHICH COULD CAUSE SUCH MOTOR VEHICLE OR MOTOR VEHICLE ENGINE TO FAIL TO CONFORM WITH APPLICABLE EMISSION STANDARDS SPECIFIED IN THIS PART OR TO FAIL TO PASS A TEST ESTABLISHED UNDER SECTION 44012 OF THIS PART FOR A PERIOD OF USE DETERMINED BY THE STATE BOARD.

(3) FREE FROM DEFECTS IN MATERIALS AND WORKMANSHIP WHICH COULD CAUSE SUCH MOTOR VEHICLE OR MOTOR VEHICLE ENGINE TO FAIL TO PASS A TEST ESTABLISHED UNDER SECTION 44012 OF THIS PART AND WHICH COST MORE THAN $300 TO REPAIR FOR A PERIOD OF USE DETERMINED BY THE STATE BOARD.

(C) THE DEPARTMENT SHALL PERIODICALLY REVISE THE $300 REPAIR COST DEDUCTIBLE IN (A)(3) AND (B)(3) OF THIS SECTION IN ACCORDANCE WITH THE CONSUMER PRICE INDEX, AS PUBLISHED BY THE UNITED STATES BUREAU OF LABOR STATISTICS.

43210.5 THE STATE BOARD, BY REGULATION, SHALL REQUIRE MANUFACTURERS TO DETERMINE THE EXTENT TO WHICH EMISSIONS RELATED DEFECTS EXIST WITHIN EACH ENGINE FAMILY AND TO RECOMMEND THE DIAGNOSTIC AND REPAIR PROCEDURES THAT CAN RESULT IN THE IDENTIFICATION 4

AND CORRECTION OF SUCH DEFECTS UNDER MOTOR VEHICLE INSPECTION AND MAINTENANCE PROGRAMS.

Chapter 5. Motor Vehicle Inspection Program

Article 1. General AND ADMINISTRATIVE

44000. THE LEGISLATURE FINDS AND DECLARES:

(A) THAT MOTOR VEHICLE INSPECTION AND MAINTENANCE PROGRAMS CAN SIGNIFICANTLY REDUCE VEHICLE EMISSIONS AND THEREBY CONTRIBUTE TO THE ATTAINMENT AND MAINTENANCE OF AMBIENT AIR QUALITY STANDARDS.

(B) THAT THE EFFECTIVENESS OF MOTOR VEHICLE INSPECTION AND MAINTENANCE PROGRAMS DEPENDS ON EFFECTIVE MONITORING AND ENFORCEMENT OF PROGRAM REQUIREMENTS.

(C) THAT THE COMPLEXITY OF VEHICLE EMISSION CONTROL SYSTEMS HAS INCREASED TO THE POINT WHERE THE QUALIFICATIONS OF INSPECTORS AND THE CAPABILITIES OF TEST EQUIPMENT MUST BE IMPROVED.

(D) THAT ORGANIZATIONAL CHANGES TO ACHIEVE MORE EFFECTIVE COORDINATION BETWEEN THE NEW MOTOR VEHICLE EMISSION CONTROL PROGRAM AND THE MOTOR VEHICLE INSPECTION AND MAINTENANCE PROGRAM WOULD ENHANCE THE EFFECTIVENESS OF BOTH PROGRAMS.

(E) THAT THE EMISSION REDUCTIONS DUE TO MOTOR VEHICLE INSPECTION AND MAINTENANCE PROGRAMS CAN BE SUBSTANTIALLY INCREASED THROUGH THE IMPLEMENTATION OF MORE EFFECTIVE INSPECTION AND REPAIR REQUIREMENTS.

(F) THAT AIR POLLUTION PROBLEMS IN MANY AREAS OF THE STATE ARE OF SUCH SEVERITY AND PERSISTENCE THAT ALL REASONABLE AIR POLLUTION CONTROL MEASURES WILL BE REQUIRED FOR THE INDEFINITE FUTURE.

(G) IT IS, THEREFORE, THE INTENT AND PURPOSE OF THE LEGISLATURE TO REQUIRE MORE EFFECTIVE MOTOR VEHICLE INSPECTION AND MAINTENANCE PROGRAMS TO BE A CONTINUING ELEMENT OF THE STATE'S VEHICULAR AIR POLLUTION CONTROL PROGRAM. It is the intent of the Legislature, in enacting this chapter, to commit the State of California to the steps necessary to commence a biennial motor vehicle inspection and maintenance program in the urban nonattainment areas of the state and, upon the request of a district, in other nonattainment areas.

1 44001. (A) THERE IS CREATED WITHIN THE RESOURCES AGENCY THE DEPARTMENT OF VEHICLE INSPECTION AND REPAIR. THE DIRECTOR OF THE DEPARTMENT SHALL BE APPOINTED BY THE GOVERNOR AND CONFIRMED BY THE SENATE. THE BUREAU OF AUTOMOTIVE REPAIR AND ALL OF ITS RESPONSIBILITIES, PROGRAMS, EMPLOYEES, AND FUNDING IS HEREBY TRANSFERRED FROM THE DEPARTMENT OF CONSUMER AFFAIRS TO THE DEPARTMENT OF VEHICLE INSPECTION AND REPAIR WITHIN THE RESOURCES AGENCY. This chapter shall remain in effect only until January 1, 1990, and as of that date is repealed, unless a later enacted statute, which is chaptered before January 1, 1990, deletes or extends that date.

5 (B) THE DEPARTMENT SHALL TAKE ALL ACTIONS NECESSARY TO ENSURE THAT THE EMISSION REDUCTIONS FROM VEHICLES SUBJECT TO THE PROGRAM MEET OR EXCEED A 25% REDUCTION IN HYDROCARBON AND CARBON MONOXIDE EMISSIONS FROM THE EMISSIONS THAT WOULD HAVE OCCURRED IN THE ABSENCE

OF THE PROGRAM. THE 25% REDUCTION SHALL BE ACHIEVED AS EXPEDITIOUSLY AS PRACTICAL, BUT NOT LATER THAN JANUARY 1, 1994.

(C) NOTWITHSTANDING ANY OTHER PROVISION OF LAW, ALL REFERENCES IN REGULATIONS AND STATUTES TO THE DEPARTMENT OF CONSUMER AFFAIRS THAT RELATE TO THE RESPONSIBIILITIES OF THE BUREAU OF AUTOMOTIVE REPAIR SHALL HENCEFORTH BE INTERPRETED TO MEAN THE DEPARTMENT OF VEHICLE INSPECTION AND REPAIR.

44002. The department shall have the sole and exclusive authority within the state for developing and implementing the motor vehicle inspection program in accordance with this chapter.

For the purposes of administration and enforcement of this chapter, the department, and the director and officers and employees thereof, shall have all the powers and authority granted under Chapter 20.3 (commencing with Section 9880) of Division 3 of the Business and Professions Code and under Chapter 33 (commencing with Section 3300) of Title 16 of the California Administrative Code. Inspections and repairs performed pursuant to this chapter, in addition to meeting the specific requirements imposed by this chapter, shall also comply with all requirements imposed pursuant to Chapter 20.3 (commencing with Section 9880) of Division 3 of the Business and Professions Code and Chapter 33 (commencing with Section 3300) of Title 16 of the California Administrative Code.

44003. (A) Any district <u>which is, or which contains, in whole or in part, a federally designated nonattainment area for the primary federal ambient air quality standards for ozone or carbon monoxide</u> may request the department to implement within its area of jurisdiction a motor vehicle inspection program which meets the requirements of this chapter. The area to be covered by the program shall INCLUDE THE ENTIRE STANDARD METROPOLITAN STATISTICAL AREA IN WHICH ANY VIOLATION OF AMBIENT AIR QUALITY STANDARDS RELATED TO MOTOR VEHICLE EMISSIONS EXISTS AND ANY OTHER AREAS WITHIN THE DISTRICT BOUNDARIES <u>be</u> specified by the requesting district OR DETERMINED BY THE STATE BOARD, IN CONSULTATION WITH THE DISTRICTS, TO CONTRIBUTE TO VIOLATIONS OF THE OZONE OR CARBON MONOXIDE AIR QUALITY STANDARDS IN THE DISTRICT OR IN ADJACENT DISTRICTS.

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(B) AT THE TIME OF THE INITIAL REQUEST UNDER (A), OR AT ANY TIME THEREAFTER, TESTING FOR OXIDES OF NITROGEN EMISSIONS SHALL BE INCLUDED AT THE OPTION OF THE DISTRICT REQUESTING THE INSPECTION PROGRAM OR UPON A DETERMINATION BY THE STATE BOARD, MADE AT A HEARING IN THE DISTRICT, THAT OXIDES OF NITROGEN TESTING WOULD CONTRIBUTE TO IMPROVED AIR QUALITY.

(C) IF NOX TESTING IS REQUESTED UNDER (B), THE DEPARTMENT SHALL IMPLEMENT A NOX TESTING PROGRAM WITHIN THE DISTRICT AS SOON AS THE DEPARTMENT CAN DEVELOP A PROCEDURE FOR NOX TESTING THAT WILL BE MORE EFFECTIVE THAN THE EXISTING TESTING PROGRAM. THE IMPLEMENTATION DATE FOR NOX TESTING SHALL BE THE EARLIEST DATE WHICH PROVIDES SUFFICIENT LEAD TIME FOR THE DEVELOPMENT, PRODUCTION, AND INSTALLATION OF NOX TESTING EQUIPMENT. THE DEPARTMENT SHALL ATTEMPT TO IMPLEMENT NOX TESTING WITHIN TWO YEARS OF THE DISTRICT'S REQUEST. IF THE DEPARTMENT DETERMINES THAT MORE TIME IS REQUIRED, THE DEPARTMENT SHALL PROVIDE THE DISTRICT WITH A DETAILED IMPLEMENTATION SCHEDULE AND SHALL

PERIODICALLY REPORT TO THE DISTRICT ON THE PROGRESS BEING MADE TO IMPLEMENT NOX TESTING.

44003.5 Any district that is not, or does not contain, a federally designated nonattainment area, but desires to utilize a motor vehicle inspection program meeting the requirements of this chapter as an air pollution control strategy, may request the department to implement the program within its area of jurisdiction if the requesting district finds, and the department concurs in, both of the following:

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(a) It adjoins a district that has a motor vehicle inspection program.

(b) The adjoining district is the workweek destination of commuter trips originating from the requesting district.

The area of district to be covered by the program shall be specified by the requesting district.

44004. (a) The motor vehicle inspection program provided by this chapter, when implemented in a district, shall supersede and replace any other program for motor vehicle emission inspection in the district.

However, this chapter shall not apply to any vehicle permanently located on an island in the Pacific Ocean located 20 miles or more from the mainland coast.

(b) The motor vehicle inspection program provided by this chapter shall be in accordance with Sections 4000.1, 4000.2, and 4000.3 of the Vehicle Code.

44005. The department, with the cooperation of the Department of Motor Vehicles, shall implement the motor vehicle inspection program provided for by this chapter consisting of a testing portion, a repair portion, and a consumer protection-oriented quality assurance portion, in accordance with the requirements of this chapter.

The program shall provide for inspection of motor vehicles upon initial registration, biennially upon renewal of registration, and upon transfer of ownership.

44006. The department shall implement ALL PROVISIONS OF THIS CHAPTER the program as expeditiously as possible, after January 1, 1983.

Article 2. Program Requirements

44010. The motor vehicle inspection program shall provide for privately operated vehicle test stations and repair stations which shall be authorized to issue certificates of compliance or noncompliance, as defined in Section 9889.18 of the Business and Professions Code, to vehicles which meet the requirements specified in this chapter.

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44011. All motor vehicles powered by internal combustion engines which are registered and garaged within AN a nonattainment area

designated for program coverage shall be required biennially to obtain a certificate of compliance or noncompliance, except for all of the following:

8 (a) Every motorcycle, every heavy-duty vehicle, AND every diesel-powered vehicle, and every liquefied petroleum gas powered vehicle until the department determines that the inclusion of those vehicles is technologically and economically feasible.

(b) Any motor vehicle which has been issued a certificate of compliance or noncompliance or a waiver upon a change of ownership or initial registration in this state during the preceding 12 months.

9 (c) Any motor vehicle MANUFACTURED PRIOR TO THE 1966 MODEL YEAR over 20 years old, as determined by the department.

(d) Any motor vehicle which the department determines would present prohibitive inspection or repair problems.

10 44011.5 DOCUMENTATION THAT A VEHICLE IS EXEMPT FROM THE REQUIREMENTS OF SECTION 44011 OF THIS PART SHALL NOT BE BASED ON THE OWNER'S WRITTEN OR VERBAL STATEMENT THAT THE VEHICLE IS IN AN EXEMPT CATEGORY. PHYSICAL INSPECTION OF THE VEHICLE BY THE DEPARTMENT SHALL BE REQUIRED IF ALTERNATIVE DOCUMENTATION IS NOT AVAILABLE.

7 44012. The test at the test AND REPAIR stations shall include all of the following:

(a) A determination that emission control devices and systems required by state and federal law are installed and functioning correctly in accordance with the test procedure adopted pursuant to subdivision (b) of Section 44013.

(b) For other than diesel-powered vehicles, a test of the vehicle's exhaust emissions of hydrocarbons, carbon monoxide, and carbon dioxide in an idle mode or loaded mode in accordance with the procedure prescribed by the department. Testing for OXIDES OF nitrogen oxide emissions shall be included IF THE NOX TESTING OPTION HAS BEEN IMPLEMENTED UNDER SECTION 44003.(C). at the option of the district requesting the inspection program.

6 (c) For diesel-powered vehicles when the department determines that the inclusion of those vehicles is technologically and economically feasible, a test of the vehicle's exhaust emissions in an idle mode or loaded mode in accordance with the procedure prescribed by the department. The test may include testing of emissions of any or all of the pollutants specified in subdivision (b) and, upon the adoption of applicable standards, measurement of emissions of smoke or particulates, or both.

(d) A determination as to whether the vehicle complies with the emission standards for that vehicle's class and model-year as prescribed by the department.

44013. (a) The department, in cooperation with the state board, shall prescribe maximum emission standards to be applied in inspecting motor vehicles under this chapter.

In prescribing the standards, the department shall undertake studies and experiments which are necessary and feasible, evaluate available data, and confer with automotive engineers.

The standards shall be set at a level reasonably achievable for each class and model of motor vehicle when operating in a reasonably sound mechanical condition, allowing for the effects of installed motor vehicle pollution control devices and the motor vehicle's age and total mileage. The standards shall be designed so that motor vehicles will be operated, as soon as possible, with a substantial reduction in emissions, and shall be revised from time to time as experience justifies.

(b) The department, in cooperation with the state board, shall research and prescribe test procedures to be applied in inspecting motor vehicles under this chapter, which procedures shall be simple, cost effective, and consistent with the requirements of Section 44012. The department may revise the test procedures from time to time as experience justifies. TO THE EXTENT THAT TEST PROCEDURE REVISIONS REQUIRE CHANGES IN EQUIPMENT AT LICENSED TEST AND REPAIR STATIONS, THE DEPARTMENT SHALL PROVIDE A REASONABLE PERIOD OF LEAD TIME FOR THE ACQUISITION AND INSTALLATION OF SUCH EQUIPMENT.

44014. (a) The testing portion of the program shall be conducted by automotive test stations licensed by the department, and by test mechanics who have qualified by completing courses prescribed by the department, pursuant to this chapter.

7 The TESTING AND repair portion of the program shall be conducted by TEST AND REPAIR repair stations licensed by the department, and by TEST AND repair mechanics who have qualified by completing courses prescribed by the department, pursuant to this chapter if the repairs are performed for compensation. TEST AND REPAIR MECHANICS SHALL BE

11 QUALIFIED TO TEST AND REPAIR ONLY THOSE CLASSES AND CATEGORIES OF VEHICLES FOR WHICH THEY HAVE SUCCESSFULLY COMPLETED THE COURSE WORK AND PASSED A QUALIFICATION TEST ADMINISTERED BY THE DEPARTMENT.

(c) (B) The consumer protection-oriented quality assurance

12 portion of the program shall MAY be conducted by more than one private entity pursuant to contracts with the department.

(d) The department shall not issue a license to a test station or a repair station which is located 15 or more miles outside of the area to be covered by the program, as specified in Section 44003.

44015. (a) A licensed test station or a licensed AND repair station shall issue a certificate of compliance or noncompliance signed by a licensed inspector for a vehicle if it meets the requirements of Section 44012.

7 (b) A licensed repair station shall issue a certificate of compliance or noncompliance signed by a licensed inspector for a vehicle if a low-emissions service and adjustment is performed, measurements of the emissions before and after the low-emissions service and adjustment are made and recorded by a qualified repair mechanic, and the mechanic certifies that the emission reductions

achieved are the maximum that can be obtained without exceeding the cost limitation established by the department.

(B) (c) With the approval of the department, a certificate of compliance or noncompliance may be issued by THE DEPARTMENT OR a REFEREE FACILITY licensed repair station when a qualified repair mechanic certifies IT IS DETERMINED that no adjustment or repair can be made that will reduce emissions from the inspected vehicle without exceeding the cost limitation established by the department AND ALL DEFECTS COVERED UNDER SECTION 43204(A)(2), SECTION 43205(A)(2)-(3), AND SECTION 43205(B)(2) HAVE BEEN CORRECTED.

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(C) (d) A certificate of compliance or noncompliance shall be valid for 90 days.

(D) (e) A test may be made at any time within three months prior to the date otherwise required.

44016. The department shall, with the cooperation of the state board and after consultation with the motor vehicle manufacturers and representatives of the service industry, research, establish, and update as necessary, specifications and procedures for motor vehicle maintenance and tuneup procedures and for repair of motor vehicle pollution control devices and systems referred to in this chapter as low-emissions service and adjustment. Licensed repair stations and qualified mechanics shall perform low-emissions service and adjustment in accordance with specifications and procedures so established.

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44017. The department shall set a cost LIMITATIONS limitation on REPAIR ACTIONS REQUIRED UNDER THE PROGRAM low-emission service and adjustment, including parts and LABOR repairs, which may vary from district to district, based upon the rate which mechanics charge in the different districts. EFFECTIVE JANUARY 1, 1990, THE COST LIMITATIONS SHALL BE $60 FOR PRE-1972 MODEL VEHICLES, $125 FOR 1972-1974 MODEL VEHICLES, $175 FOR 1975-1979 MODEL VEHICLES, $250 FOR 1980-1989 MODEL VEHICLES, AND $300 FOR 1990 AND LATER MODEL VEHICLES. THE DEPARTMENT SHALL PERIODICALLY REVISE THESE COST LIMITS IN ACCORDANCE WITH The cost limitation on the low-emissions service and adjustment shall be set initially at not more than fifty dollars ($50), and may be increased to one hundred dollars ($100) taking into consideration mechanics' hourly rates and increases in the cost of living as reflected in the Consumer Price Index, as published by the United States Bureau of Labor Statistics. No limit shall be imposed in those cases where emissions control equipment is missing or is partially or totally inoperative as a result of tampering.

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44018. (a) The motor vehicle inspection program may include advisory safety equipment maintenance checks, fuel efficiency checks, or both, on the motor vehicle if the department finds that cost-effective methods for conducting those checks exist and that the cost of the inspection to the vehicle owner due to the additional checks would not be increased by more than 10 percent. The department shall specify the equipment to be checked and the procedures for conducting those checks.

(b) Notwithstanding subdivision (a), a motor vehicle sold at retail by a lessor-dealer licensed pursuant to Chapter 3.5 (commencing

with Section 11600), or a dealer licensed pursuant to Chapter 4 (commencing with Section 11700), of Division 5 of the Vehicle Code shall not be subject to an advisory safety equipment maintenance check pursuant to this section.

44019.(A) The motor vehicle inspection program shall require that Any motor vehicle subject to this chapter owned by a governmental entity or public utility, and not required by law to have its registration renewed, SHALL OBTAIN A CERTIFICATE OF COMPLIANCE WITH THE SAME FREQUENCY REQUIRED FOR VEHICLES SUBJECT TO REGISTRATION RENEWAL. be tested, and that necessary service and adjustments be performed, in accordance with a schedule established by the department.

16 (B) CERTIFICATES OF COMPLIANCE REQUIRED UNDER (A) SHALL BE OBTAINED USING A TEST ANALYZER SYSTEM MEETING THE REQUIREMENTS OF SECTION 44036.

(C) CERTIFICATES OF COMPLIANCE REQUIRED UNDER (A) SHALL BE INDEXED BY VEHICLE LICENSE PLATE NUMBER OR VEHICLE IDENTIFICATION NUMBER AND RETAINED BY VEHICLE OWNER FOR A PERIOD OF NOT LESS THAN THREE YEARS AND SHALL BE AVAILABLE FOR INSPECTION BY THE DEPARTMENT.

(D) EACH VEHICLE OWNER SUBJECT TO (A) SHALL ANNUALLY REPORT TO THE DEPARTMENT THE NUMBER OF CERTIFICATES ISSUED AND THE NUMBER OF VEHICLES OWNED AND THE SCHEDULE UNDER WHICH VEHICLES RECEIVED CERTIFICATES OF COMPLIANCE.

44020. Notwithstanding any other provision of this chapter, the department may license any owner of a fleet of 15 or more motor vehicles subject to this chapter, subject to all of the following conditions:

(a) The owner's facilities or personnel, or both, or a designated contractor of the owner, shall be certified by the department, and the test and repair system shall conform, in the department's determination, with all provisions of this chapter and all rules and regulations adopted by the department. The regulations shall provide for adequate onsite inspection by the department.

(b) A license issued under this section shall be suspended or rescinded by the department whenever the department determines, on the basis of random spot checks of the owner's inspection system and fleet vehicles, that the system fails to conform or that certificates of compliance have been issued by the owner in violation of regulations adopted by the department. Any person licensed to conduct tests and service and adjustments under this section is deemed to have consented to provide the department with whatever access, information, and other cooperation the department reasonably determines are necessary to facilitate the random spot checks.

(c) A fleet owner authorized to conduct tests or make repairs pursuant to this chapter shall issue certificates of compliance for motor vehicles which comply with the requirements of this chapter. The cost limitations in Section 44017 shall not apply to any motor vehicle owned by a fleet owner licensed pursuant to this section.

44021. (a) The department shall conduct ongoing cost benefit analyses and other evaluations of the inspection program, including,

but not limited to, observed patterns of malfunctions in inspected motor vehicles' emissions control systems, inquiries from the public regarding emissions system warranties, inspection and repair costs, the failure rate after repairs, and recommendations for legislation to improve the inspection program.

Commencing not later than two years after the date of implementation of the program, the department shall submit periodic written reports, at least every 12 months, to the Legislature on the analyses and evaluations of the program. The department shall conduct at least one public hearing prior to submitting EACH the first report and shall include pertinent information which it receives form the public hearing in that report.

(b) A review committee is hereby created to analyze the effect of the program on vehicle emissions and air quality. The review committee shall consist of a representative from the state board and a representative from each of the districts in which the motor vehicle inspection program has been implemented. A COMMITTEE CHAIRMAN SHALL BE ELECTED BY MAJORITY VOTE OF THE MEMBERS AND SHALL SERVE AT THE PLEASURE OF A MAJORITY OF THE MEMBERS. THE MEMBERS OF THE REVIEW COMMITTEE SHALL RECEIVE NO COMPENSATION FOR THEIR SERVICES, BUT SHALL BE REIMBURSED BY THE DEPARTMENT FOR THEIR ACTUAL AND NECESSARY EXPENSES IN PERFORMING THEIR DUTIES UNDER THIS SUBDIVISION. THE STATE BOARD AND THE DEPARTMENT SHALL PROVIDE TECHNICAL AND CLERICAL SUPPORT TO THE REVIEW COMMITTEE TO ASSIST IN THE EVALUATION OF PROGRAM EFFECTIVENESS. DUTIES OF REVIEW COMMITTEE MEMBERS SHALL INCLUDE PARTICIPATION IN PERIODIC MEETINGS OF THE REVIEW COMMITTEE WHICH SHALL BE HELD ON A SCHEDULE ESTABLISHED BY THE COMMITTEE. IT SHALL BE THE RESPONSIBILITY OF THE CHAIRMAN OF THE REVIEW COMMITTEE OR HIS OR HER DESIGNEE TO PERIODICALLY MEET AND CONSULT WITH LOCAL, STATE, AND FEDERAL OFFICIALS INVOLVED IN THE EVALUATION OF INSPECTION MAINTENANCE PROGRAMS. The committee shall conduct at least one public hearing prior to submitting its report to the Legislature and shall include pertinent information which it receives from the public hearings in its report. The first report shall be submitted not later than 36 months following the implementation of the program. Thereafter, the committee shall submit periodic written reports to the Legislature on the program at least every 24 months. The committee's REPORTS report shall quantify the reduction in emissions and improvement in air quality attributed to the program.

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(C) IN AREAS WHERE NOX TESTING HAS NOT BEEN IMPLEMENTED, THE COMMITTEE WILL DETERMINE WHETHER THE AVERAGE REDUCTION IN EMISSIONS OF HYDROCARBONS AND CARBON MONOXIDE FROM INSPECTED VEHICLES IS AT LEAST 25 PERCENT OF THE EMISSIONS THAT WOULD HAVE OCCURRED IN THE ABSENCE OF THE PROGRAM.

(D) IN AREAS WHERE NOX TESTING HAS BEEN IMPLEMENTED, THE COMMITTEE WILL DETERMINE WHETHER THE REDUCTION IN EMISSIONS OF HYDROCARBONS FROM INSPECTED VEHICLES IS AT LEAST 40 PERCENT, THE REDUCTION IN CARBON MONOXIDE EMISSIONS IS AT LEAST 25 PERCENT, AND THE REDUCTION IN EMISSIONS OF OXIDES OF NITROGEN IS AT LEAST 20 PERCENT OF THE EMISSIONS THAT WOULD HAVE OCCURRED IN THE ABSENCE OF THE PROGRAM.

(E) If the COMMITTEE study determines that the average reduction in emissions of hydrocarbons and carbon monoxide from inspected vehicles is less than THE PERCENTAGES SPECIFIED IN (C) OR (D), 10

percent the report shall recommend improvements to increase the effectiveness of the program AND THE DEPARTMENT SHALL TAKE ALL FEASIBLE ACTIONS TO IMPLEMENT THE COMMITTEE'S RECOMMENDATIONS AND ACHIEVE THE PERCENTAGE REDUCTIONS SPECIFIED IN (C) AND (D) AS EXPEDIOUSLY AS PRACTICAL. If the committee cannot identify and recommend improvements to the program to achieve emissions reductions of at lest 10 percent, the report shall recommend termination of the program.

Article 3. Quality Assurance

44030. (a) The department shall develop standards for the licensing of test stations. Tests performed at test stations shall be performed by a qualified test mechanic.

The licensing standards for test stations may include, but not be limited to, requirements for all of the following:

(1) Use of computerized and tamper-resistant analyzers.

(2) Annual license renewal.

7 (3) Onsite availability of current emission control system information.

(b) The department shall develop standards for the licensing of TEST AND repair stations. Service and adjustment at TEST AND repair stations shall be performed by a qualified TEST AND repair mechanic.

The licensing standards for TEST AND repair stations may include, but not be limited to, requirements for all of the following:

(1) Use of computerized and tamper-resistant TESTING EQUIPMENT INCLUDING, BUT NOT LIMITED TO, TEST ANALYZER SYSTEMS analyzers MEETING THE CURRENT REQUIREMENTS OF THE DEPARTMENT.

(2) Annual license renewal.

(3) Onsite availability of current emission control system information and service and adjustment procedures.

44030.5. The department shall, in addition to administering training courses, develop standards for certification of institutions

18 and instructors for purposes of providing prerequisite training of test AND REPAIR mechanics or repair mechanics, or both. The standards shall include criteria for applications manuals, textbooks, laboratory equipment, laboratory exercises, hands-on work, examinations and other matters the department determines necessary for a certified course of instruction.

The standards shall also specify the conditions under which an institution or instructor may be decertified, and under which a decertified institution or instructor may regain certification.

7 44031. (a) The owner or manager of every licensed test AND REPAIR station and of every licensed repair station shall be a licensed inspector.

(b) Every licensed inspector either shall have completed training courses administered MEETING THE STANDARDS DEVELOPED under Section

18 44031.5 or shall be a qualified test AND REPAIR mechanic or qualified repair mechanic.

(c) The license of a licensed inspector shall be issued for a period of two years, commencing January 1, 1988, and is subject to renewal every two years thereafter. The department shall established initial and renewal license fees, which shall not exceed twenty dollars ($20) or the cost of administering training courses prescribed under subdivision (b), whichever is the lesser amount.

19 44031.5. (a) No test AND REPAIR mechanic or repair mechanic may perform tests or make repairs REQUIRED BY THIS CHAPTER for compensation, unless qualified by the completion of training courses CERTIFIED prescribed and administered by the department.

(b) No person may perform the duties of a licensed inspector, including, but not limited to, the signing of certificates, unless that person is licensed and has met the requirements of subdivision (b) of Section 44031. This subdivision applies to every licensed inspector upon the first renewal of the inspector's license after January 1, 1988, and upon each renewal thereafter.

(c) The department shall prescribe and administer training and periodic retraining courses for licensed inspectors, for test AND REPAIR mechanics, and for repair mechanics. THE COURSES PRESCRIBED BY THE DEPARTMENT SHALL PROVIDE FOR INSPECTORS AND MECHANICS TO BE 11 QUALIFIED FOR VARIOUS CATEGORIES OF VEHICLE INSPECTION BASED ON VEHICLE CLASSIFICATION AND MODEL YEAR RANGE.

(d) Whenever the department determines, through investigation, that a previously qualified mechanic may lack the skills to reliably and accurately perform the test or repair functions within the required qualification, it may prescribe one or more retraining courses for the mechanic. The mechanic may request and be granted a hearing, pursuant to Chapter 5 (commencing with Section 11500) of Part 1 of Division 3 of Title 2 of the Government Code, on the department's determination. The request for a hearing shall be submitted within 30 days of the department's notification of its determination. A failure to complete the prescribed retraining course within the time designated by the department, or to request a hearing within 30 days of the department's notification of its determination, shall result in loss of qualification. Upon a later completion of the prescribed retraining course, the department may reinstate the mechanic's qualification.

7 (e) Test AND REPAIR mechanics and repair mechanics shall have the option to do hands-on work in lieu of written work in order to successfully complete the training and retraining courses. The department shall issue a certificate of completion to each person successfully completing the courses and testing. THE CERTIFICATE SHALL BE VALID FOR TWO YEARS UNLESS REVOKED OR SUSPENDED BY THE DEPARTMENT.

(f) There is hereby created a training course advisory board to 1 assist and advise the department in recommending the form and content of training courses. The advisory board shall consist of five members appointed by the Director of THE DEPARTMENT Consumer Affairs, of whom 7 two shall represent TEST AND repair station or test station owners or managers, two shall represent TEST AND repair or test mechanics, and one shall be a public member. The members of the advisory board shall receive no compensation for their services, but shall be reimbursed

for their actual and necessary expenses in performing their duties under this subdivision.

44032. No person shall perform, for compensation, tests or repairs of emission control devices or systems REQUIRED BY THIS CHAPTER, of vehicles in an area where the program provided by this chapter is being implemented, unless the person performing the test or repair is a qualified test AND REPAIR mechanic or qualified repair mechanic and the test or repair is performed at a licensed test AND or repair station, respectively.

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44033. (a) Any facility meeting the requirements established by the department pursuant to this chapter may be licensed as a TEST AND repair station or test station. A licensed station shall display an identifying sign prescribed by the department in a manner conspicuous to the public. Licensed repair stations shall be authorized to do tests, and shall meet all the requirements established for both test stations and repair stations.

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(b) No licensed test station shall require, as a condition of performing the test, that any needed repairs or adjustment be done by the person, or at the facility of the person, performing the test.

(c) If a vehicle is tested at a facility licensed to do both testing and repairs, the facility shall include on the written estimate, as described in Section 9884.9 of the Business and Professions Code, a notice to the customer that the customer may choose another facility to perform needed repairs or adjustments. If a licensed facility has existing forms that do not include the notice required by this subdivision, it may continue using those forms until January 1, 1988, or until those forms are exhausted, whichever occurs first.

(d) Charges for testing or repair, or both, shall be separately stated.

(e) The department shall require the posting of station licenses, inspector licenses, and qualified mechanics certificates prominently in each place of business so as to be readily visible to the public.

44034. Annual license fees for test AND REPAIR stations and repair stations, and training course fees for test AND REPAIR mechanics and repair mechanics, may be imposed by the department, but shall not exceed the reasonable cost of administering the qualifications and licensing program and shall not exceed ten dollars ($10).

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44035. A test AND REPAIR station's license, a repair station's license, and inspector's license, a qualified test mechanic's qualification, or a qualified TEST AND repair mechanic's qualification may be suspended or revoked by the department, after a hearing, for failure to meet or maintain the standards prescribed for qualification, equipment, performance, or conduct. The department shall adopt rules and regulations governing the suspension, revocation, and reinstatement, of licenses and qualifications and the conduct of the hearings.

44036. (a) The consumer protection-oriented quality assurance portion shall ensure uniform and consistent tests and repairs by all qualified mechanics and licensed test AND REPAIR stations and repair stations throughout the district, and shall include a number of referee stations available to consumers. Sufficient referee stations shall be provided to accommodate at least 2 percent of the vehicles subject to the requirements of this chapter.

(b) All licensed test AND or repair stations shall utilize equipment which has been certified by the department. The department shall adopt, AND MAY FROM TIME TO TIME REVISE, standards for certification of the equipment, which MAY INCLUDE A DEVICE FOR NOX TESTING. AS EXPEDIOUSLY AS POSSIBLE, THE DEPARTMENT SHALL ESTABLISH EQUIPMENT STANDARDS WHICH shall include A TEST ANALYZER SYSTEM CONTAINING all of the following:

(1) A microprocessor to control test sequencing, selection of proper test standards, AND the automatic pass or fail decision, and the format for the test report and recorded magnetic tape file. THE MICROPROCESSOR MUST BE CAPABLE OF USING A STANDARDIZED PROGRAMMING LANGUAGE SPECIFIED BY THE DEPARTMENT.

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(2) An exhaust gas analysis portion WITH ANALYZERS FOR HYDROCARBONS, CARBON MONOXIDE AND CARBON DIOXIDE WHICH IS DESIGNED TO ACCOMMODATE AN OPTIONAL OXIDES OF NITROGEN ANALYZER.

(3) A device to accept and record vehicle identification information INCLUDING A DEVICE CAPABLE OF READING BAR CODE INFORMATION AFFIXED TO VEHICLES PURSUANT TO REGULATIONS OF THE STATE BOARD.

(4) A device to provide a printed record of the test process AND DIAGNOSTIC INFORMATION for the motorist.

(5) A DEVICE CAPABLE OF MEASURING ENGINE SPEED FROM ALL MODELS OF SPARK IGNITION PASSENGER CARS AND LIGHT-DUTY TRUCKS IN CUSTOMER SERVICE AT THE TIME THE SPECIFICATION IS ADOPTED BY THE DEPARTMENT.

(6) A MASS STORAGE DEVICE CAPABLE OF STORING NOT LESS THAN THE MINIMUM AMOUNT OF PROGRAM SOFTWARE AND DATA SPECIFIED BY THE DEPARTMENT.

(7) A DEVICE TO PROVIDE FOR THE PERIODIC MODIFICATION OF ALL PROGRAM AND DATA FILES CONTAINED ON THE MASS STORAGE DEVICE USING A STANDARDIZED FORM OF REMOVABLE MEDIA CONFORMING TO SPECIFICATIONS OF THE DEPARTMENT.

(8) A DEVICE WHICH PROVIDES FOR THE STORAGE OF TEST RECORDS ON A STANDARDIZED FORM OF REMOVABLE MEDIA CONFORMING TO SPECIFICATIONS OF THE DEPARTMENT.

(9) ONE OR MORE COMMUNICATIONS PORTS CONFORMING TO THE SPECIFICATIONS ESTABLISHED BY THE DEPARTMENT.

(10) AN ELECTRICAL INTERFACE CAPABLE OF CONTROLLING EQUIPMENT USED WITH LOADED MODE TESTING.

(11) SUCH OTHER FEATURES THAT THE DEPARTMENT DETERMINES WOULD INCREASE THE EFFECTIVENESS OF THE PROGRAM.

(c) THE DEPARTMENT SHALL REQUIRE ALL TEST AND REPAIR STATIONS TO USE EQUIPMENT MEETING THE REQUIREMENTS OF (B) OF THIS SECTION AS SOON AS POSSIBLE AFTER JULY 1, 1990 BUT NOT LATER THAN JANUARY 1, 1992. PRIOR TO A REQUIREMENT FOR EQUIPMENT MEETING THE REQUIREMENTS OF (B) OF THIS SECTION, TEST AND REPAIR STATIONS SHALL USE EQUIPMENT MEETING THE SPECIFICATIONS OF THE DEPARTMENT IN EFFECT ON JANUARY 1, 1988. The department may approve certified test equipment in use

prior to January 1, 1982, if the equipment meets the specifications developed by the department under subdivision (b). Any equipment required may be supplied by a single supplier in any nonattainment area if it is determined that there would be a demonstrable cost savings as shown through the solicitation and evaluation of competitive bids for each nonattainment area. If it is determined that any equipment required shall be supplied by a single supplier, the supplier shall enter into a master agreement with the department specifying the prices, terms, and conditions under which the supplier will provide equipment in a uniform manner within the nonattainment area. The master agreement shall contain terms consistent with the bid upon which it is based.

12 (d) IF THE DEPARTMENT ELECTS TO CONTRACT FOR SERVICES In contracting pursuant to subdivision (c) of Section 44014, the department shall prepare detailed specifications and solicit bids from private entities for the implementation of the quality assurance portion. The quality assurance portion shall provide for inspections of licensed test AND REPAIR stations and repair stations, data collection and forwarding, equipment accuracy checks, operation of referee stations, and other necessary functions.

20 (C) THE DEPARTMENT MAY REVISE THE SPECIFICATIONS FOR EQUIPMENT ANNUALLY PROVIDED THE COST OF EQUIPMENT REVISIONS IS LESS THAN 20% OF TOTAL SYSTEM COST. MORE COMPREHENSIVE REVISION TO THE SPECIFICATIONS MAY BE REQUIRED EVERY FIVE YEARS.

44037. The department shall compile and maintain records, using the sampling methodology necessary to ensure their scientific validity and RELIABILITY realiability, of tests and repairs performed by

7 qualified mechanics at licensed test AND REPAIR stations and repair stations pursuant to this chapter on all of the following information:

(a) The vehicle identification information and the test data collected at the station.

(b) The number of maintenance and repair operations performed on motor vehicles which fail to pass a test conducted pursuant to the provisions of this chapter.

(c) The correlation between maintenance and repairs recommended by the department pursuant to Section 44016 and maintenance and repairs performed.

(d) The charges assessed for the service and repairs.

(e) Any other information deemed essential by the department. A written summary of all of the above information shall be published quarterly for the mechanics and dealers in each district and shall be available to the public upon request.

7 44038. Each test station shall transmit vehicle data and emission test results to the department. Each TEST AND repair station shall transmit to the department vehicle data and emission measurements made before and after REPAIR low-emission service and

14 adjustment. The department shall establish, by regulation, the form, manner, and frequency of the data transmittals.

44039. A written summary of the required information applicable to test and repair stations in each district shall be published

semiannually by the department and made available upon request to the owner of any motor vehicle subject to this chapter.

44040. THE DEPARTMENT SHALL REQUIRE CERTIFICATES OF COMPLIANCE AND CERTIFICATES OF NONCOMPLIANCE TO CONTAIN A UNIQUE NUMBER ENCODED IN BAR CODE. SUCH CERTIFICATES MAY BE SOLD TO LICENSED STATIONS BY THE DEPARTMENT OR PRINTED BY TEST ANALZER SYSTEMS. THE DEPARTMENT OF MOTOR VEHICLES SHALL USE A BAR CODE READING DEVICE TO RECORD THE NUMBER ENCODED ON EACH CERTIFICATE RECEIVED AND SHALL, ON A MONTHLY BASIS, PROVIDE A COMPUTER TAPE TO THE DEPARTMENT CONTAINING THE LIST OF EACH CERTIFICATE NUMBER AND THE ASSOCIATED LICENSE PLATE AND VEHICLE IDENTIFICATION NUMBER.

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Article 4. Penalties

44050. (a) If, upon investigation, the department has probable cause to believe that a licensed test AND REPAIR station, a licensed repair station, a licensed inspector, or a fleet owner licensed under Section 44020 has violated this chapter, or any regulation adopted pursuant to this chapter, the department may issue a citation to the licensee or fleet owner. The citation shall specify the nature of the violation and may specify a civil penalty assessed by the department pursuant to Section 44051 or 44051.5.

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(b) If, upon investigation, the department has probable cause to believe that a qualified test AND REPAIR mechanic or a qualified repair mechanic has violated Section 44012 or 44015, or any regulation adopted pursuant to this chapter, the department may issue a citation to the mechanic. The citation shall specify the nature of the violation and, in addition, whichever of the following applies:

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(1) For a first or second citation, the mechanic shall complete one or more retraining courses prescribed by the department pursuant to subdivision (d) of Section 44031.5.

(2) For a third citation, the mechanic shall complete one or more retraining courses prescribed by the department pursuant to subdivision (d) of Section 44031.5 and the mechanic's qualification shall be suspended until that completion.

(3) For a fourth citation, the mechanic's qualification shall be permanently revoked.

(c) The citation shall be served pursuant to subdivision (c) of Section 11505 of the Government Code.

44050.5. In assessing a civil penalty pursuant to Section 44050 against a person who has not previously been cited for a violation of the same statute or regulation, the department shall fix the penalty at an amount within the minimum and maximum penalties specified in Section 44051 or 44051.5, as the case may be, for each violation.

44051. The civil penalty for a violation of the specified provisions of this chapter is as follows:

Section	Short Description of Violation	Civil Penalty Minimum	Maximum
44012(a)	No emission control system inspection	$250	$1,500
44012(b)	No emissions test	250	1,500
44014(a)	Unlicensed test station or mechanic	250	1,500
44015(a,b,c)	Failure to issue certificate signed by licensed inspector	150	1,000
44017	Cost limitation requirement	150	1,000
44031.5(a)	Test/repair by unlicensed station or nonqualified mechanic	250	1,500
44033(a)	Test/repair station requirement	100	500
44033(b)	Test on condition of mandatory repair waiver	250	1,500
44033(c)	Signed repair waiver requirement	250	1,500
44033(d)	Test/repair charges separate	100	500
44036(b)	Test/repair station certified equipment requirement	150	1,500
44060(b)	Sale, transfer or purchase of certificate	250	1,500

44051.5 The civil penalty for a violation of the specified provisions of Title 16 of the California Administrative Code is as follows:

Section	Short Description of Violation	Civil Penalty Minimum	Maximum
3340.15(a-j)	Test/repair station general requirements	$100	$ 500
3340.16	Test station equipment and testing procedures	150	1,000
3340.16.5	Test/repair station equipment and testing procedures	150	1,000
3340.17	Test/repair station equipment maintenance and calibration	150	1,000
3340.20	Acknowledgement and waiver requirement	250	1,500
3340.22	Test/repair station sign requirement	100	500

3340.23	Test/repair cease operations	250	1,500
3340.25	Licensed inspector requirement	250	1,500
3340.30	Qualified mechanics training and certification requirement	100	500
3340.35	Certification of compliance and noncompliance requirement	250	1,500
3340.37	NOx device/sticker requirement	100	500
3340.40	Low emissions service and adjustment requirement	150	1,000
3340.41	Inspection/test/repair requirement	150	1,000
3340.42	Inspection standards, test procedures, and exhaust emissions requirement	100	500
3340.45	Cost limitation requirement	100	500

44052. (a) When a citation lists more than one violation, the amount of the civil penalty assessed shall be stated separately for each statute and regulation violated.

(b) When a citation lists more than one violation arising from a single motor vehicle inspection or repair, the total penalties assessed shall not exceed two thousand five hundred dollars ($2,500).

44052. The willful making of any false statement or entry with regard to a material matter in any oath, affidavit, certificate of compliance or noncompliance, or application form which is required by this chapter or Chapter 20.3 (commencing with Section 9880) of Division 3 of the Business and Professions Code, constitutes perjury and is punishable as provided in the Penal Code.

44053. (a) Any person issued a citation pursuant to Section 44050 may request a hearing in accordance with Chapter 5 (commencing with Section 11500) of Part 1 of Division 3 of Title 2 of the Government Code. A request for a hearing shall be submitted in writing within 30 days of service of the citation, and shall be delivered to the office of the Bureau of Automotive Repair of the department in Sacramento. Hearings and related procedures under this section shall be conducted in the same manner as proceedings for adjudication of an accusation under that Chapter 5, except as otherwise specified in this article.

(b) If, within 30 days from service of the citation, the licensee or qualified mechanic fails to request a hearing, the citation shall be deemed the final order of the department.

44054. In assessing a civil penalty pursuant to a citation issued pursuant to Section 44050, the Director of VEHICLE INSPECTION AND REPAIR Consumer Affairs shall give due consideration to the gravity of the violation, including, but not limited to, a consideration of whether any of the following apply to the licensee:

(a) A failure to perform work for which money was received.

(b) The making of any false or misleading statement in order to induce a person to authorize repair work or pay money.

(c) The commission of numerous or repeated violations.

(d) A failure to make restitution to customers affected by the licensee's violation.

44055. (a) Any failure to comply with the final order of the department for payment of a civil penalty, or to pay the amount specified in any settlement executed by the licensee and the Director of VEHICLE INSPECTION AND REPAIR Consumer Affairs, shall result in denial of any application for the renewal of the license. The department shall not renew a license or furnish any certificate of compliance or noncompliance forms to the licensee until all civil penalties which have become final, or amounts agreed to in a settlement, have been paid by the licensee.

(b) The department may deny an application for the renewal of a test AND REPAIR station or repair station license if the applicant, or any partner, officer, or director thereof, has failed to pay any civil penalty in accordance with this article.

44056. (a) Except as otherwise provided in Sections 44051 and 44051.5, any person who violates any provision of this chapter, or any order, rule, or regulation of the department adopted pursuant to this chapter, is liable for a civil penalty not to exceed five hundred dollars ($500) for each day in which each violation occurs. Any action to recover civil penalties shall be brought by the Attorney General in the name of the state on behalf of the department, or may be brought by any district attorney, city attorney, or attorney for a district.

(b) The penalties specified in subdivision (a) do not apply to an owner or operator of a motor vehicle, except an owner or operator who does any of the following:

(1) Obtains, or who attempts to obtain, a certificate of compliance or noncompliance without complying with the requirements of Section 44015.

(2) Registers a motor vehicle at an address other than the owner's or operator's residence address for the purpose of avoiding the requirements of this chapter.

44057. A continuing violation of any provision of this chapter, or any order, rule, or regulation of the department adopted pursuant to this chapter, may be enjoined by the superior court of the county in which the violation is occurring. The action shall be brought by the attorney general in the name of the state on behalf of the department, or may be brought by any district attorney, city attorney, or attorney for a district. An action brought under this section shall conform to the requirements of Chapter 3 (commencing with

Section 525) of Title 7 of Part 2 of the Code of Civil Procedure, except that it shall not be necessary to show lack of an adequate remedy at law or to show irreparable damage or loss.

In addition, if it is shown that the respondent continues, or threatens to continue, to violate any provision of this chapter, or any order, rule, or regulation of the department adopted pursuant to this chapter, it shall be sufficient proof to warrant the immediate granting of a temporary restraining order.

44058. Any person who violates this chapter, or any order, rule, or regulation of the department adopted pursuant to this chapter, is guilty of a misdemeanor and shall be punished by a fine of not more than one thousand dollars ($1,000) or by imprisonment for not more than six months, or by both, in lieu of the imposition of the civil penalties.

Article 5. Financial Provisions

44060. (a) The department shall prescribe the form of the
7 certificate of compliance or noncompliance. The department shall charge a fee to licensed test AND REPAIR stations and repair stations for the issuance by the department to the stations of certificate of compliance or noncompliance forms. The fee charged shall be calculated to allow funding of the department and any other state agency directly involved in the implementation of the motor vehicle inspection program, and shall not exceed the amount reasonably necessary to fund the operation of the program, including all responsibilities, requirements, and obligations imposed upon the department or any of those state agencies by this chapter, which are not otherwise recoverable by license fees pursuant to Section 44034.
22 EXCEPT FOR ADJUSTMENTS TO ACCOUNT FOR CHANGES IN THE CONSUMER PRICE INDEX SINCE THE FEE WAS INITIALLY ESTABLISHED In no event shall the fee for each certificate of compliance or noncompliance SHALL NOT exceed six dollars ($6). It is the intent of the Legislature that the Vehicle Inspection Fund shall maintain a prudent surplus. If the surplus exceeds reasonable costs of administration of the program, the department shall, by regulation, prescribe a lower fee for the certificate of compliance or noncompliance.

(b) The sale or transfer of any certificate of compliance or
7 noncompliance by a licensed repair station to any other licensed test AND REPAIR station or repair station or any other person, and the purchase or acquisition of any certificate of compliance or noncompliance by any person, other than from the department, the department's designee, or pursuant to a vehicle inspection or repair conducted pursuant to this chapter, is prohibited.

44061. The fees collected by the department pursuant to Sections 44034 and 44060, and penalties collected pursuant to Section 44050, shall be deposited in the Vehicle Inspection Fund in accordance with the procedures established by the department, and shall be available to the department and any other state agency directly involved in the implementation of the motor vehicle inspection program to carry out

its functions and duties specified in this chapter or in any other law, upon appropriation by the Legislature.

Article 6. Public Information

44070. (a) The department shall develop within the Bureau of Automotive Repair, with the advice and technical assistance of the state board, a public information program for the purpose of providing emissions warranty information to motor vehicle owners subject to an inspection and maintenance program required pursuant to this chapter. The bureau shall provide, upon request, either orally or in writing, information regarding emissions related warranties and available warranty dispute resolution procedures.

(b) The telephone number and business hours, and the address if appropriate, of the emissions warranty information program shall be noticed on the vehicle inspection report provided by the test analyzer system for any vehicle which fails the analyzer test.

44071. For purposes of implementing the emissions warranty information program, the department shall use funds from the fee charged for each certificate of compliance or noncompliance which are deposited in the Vehicle Inspection Fund pursuant to Section 44060.

BUSINESS AND PROFESSIONS CODE

DIVISION 3. PROFESSIONS AND VOCATIONS GENERALLY

Chapter 20.3 AUTOMOTIVE REPAIR

Article 6. Lamp and Brake Adjusting Stations and Motor Vehicle Pollution Control Device Installation and Inspection Stations

9888.1 (c) "Licensed Installer" means a person licensed by the bureau for installing, repairing, inspecting, or recharging motor vehicle pollution control devices, or performing emissions related repairs pursuant to Section 9889.60 or 9889.74 Health and Safety Code Section 44031, in licensed stations.

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9888.2 The director shall adopt regulations which prescribe the equipment and other qualifications of any station as a condition to licensing the station as an official station for adjusting lamps or brakes and for installing, repairing, inspecting, or recharging motor vehicle pollution control devices and shall prescribe the qualifications for adjusters and installers employed therein. THE QUALIFICATIONS FOR LICENSED STATIONS FOR INSTALLING, REPAIRING, INSPECTING, OR RECHARGING MOTOR VEHICLE POLLUTION CONTROL DEVICES

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SHALL BE IDENTICAL TO THOSE FOR TEST AND REPAIR STATIONS LICENSED UNDER CHAPTER 5 OF PART 5 OF DIVISION 26 OF THE HEALTH AND SAFETY CODE. THE QUALIFICATIONS FOR LICENSED INSTALLERS SHALL BE IDENTICAL TO THOSE FOR LICENSED INSPECTORS UNDER CHAPTER 5 OF PART 5 OF DIVISION 26 OF THE HEALTH AND SAFETY CODE.

After consulting with the Department of the California Highway Patrol and the State Air Resources Board, the director may, by regulation, approve testing and calibrating equipment, which is capable of measuring or calibrating the standards imposed by statute and by rules and regulations, for use in official stations, and may approve the testing laboratories and the equipment they use to certify the performance of testing and calibrating equipment. EQUIPMENT REQUIREMENTS FOR LICENSED STATIONS FOR INSTALLING, REPAIRING, INSPECTING, OR RECHARGING MOTOR VEHICLE POLLUTION CONTROL DEVICES SHALL BE IDENTICAL TO THOSE FOR TEST AND REPAIR STATIONS LICENSED UNDER CHAPTER 5 OF PART 5 OF DIVISION 26 OF THE HEALTH AND SAFETY CODE.

9888.3. No person shall operate a motor vehicle pollution control device installation and inspection station or an "official" lamp or brake adjusting station unless a license therefor has been issued by the director. No person shall issue, cause or permit to be issued, any certificate perported to be an official lamp adjustment certificate unless he is a licensed lamp adjuster, and official brake adjustment certificate unless he is a licensed brake adjuster, or a certificate of compliance unless he is a licensed motor vehicle pollution control device installer except as provided in CHAPTER 5 OF PART 5 OF DIVISION 26 OF THE HEALTH AND SAFETY CODE Section 9889.56.

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9889.17. Any person may install a motor vehicle pollution control device; however, no person who is not a QUALIFIED TEST AND REPAIR MECHANIC UNDER CHAPTER 5 OF PART 5 OF DIVISION 26 OF THE HEALTH AND SAFETY CODE licensed installer shall install such a device for compensation. No such device shall be deemed to meet the requirements of the Vehicle Code or Part 5 (commencing with Section 43000) of Division 26 of the Health and Safety Code, and the rules and regulations of the State Air Resources Board, unless it has been inspected and a certificate of compliance has been issued pursuant to HEALTH AND SAFETY CODE SECTION 44015 Section 9889.18 or 9889.56.

9889.18. (section deleted)

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Chapter 20.4. Mandatory Vehicle Emission Inspection and Testing Program

(Entire Chapter is deleted.)

VEHICLE CODE
CERTIFICATE OF COMPLIANCE

4000.1. (a) Except as otherwise provided in subdivision (b), (c), or (d) of this section, or sudivision (b) of Section 43654 of the Health and Safety Code, the department shall require upon initial registration, and upon transfer of ownership and registration, of any motor vehicle subject to Part 5 (commencing with Section 43000) of Division 26 of the Health and Safety Code, and upon registration of a motor vehicle previously registered outside this state which is subject to those provisions of the Health and Safety Code, a valid certificate of compliance or a certificate of noncompliance, as appropriate, issued in accordance with Section 44015 of the Health and Safety Code or with Section 9889.18 or 9889.56 of the Business and Professions Code.

4000.2 (a) Except as otherwise provided in subdivision (b) of Section 43654 of the Health and Safety Code, the department shall require upon registration of a motor vehicle subject to Part 5 (commencing with Section 43000) of Division 26 of the Health and Safety Code, previously registered outside this state, a valid certificate of compliance or a certificate of noncompliance, as appropriate, issued in accordance with Section 44015 of the Health and Safety Code or with Section 9889.18 or 9889.56 of the Business and Professions Code.

4000.3 (a) Except as otherwice provided in Section 44011 of the Health and Safety Code, following implementation in a district of a motor vehicle inspection program pursuant to Chapter 5 (commencing with Section 44000) of Part 5 of Division 26 of the Health and Safety Code, the department shall require biennially, upon renewal of registration of any motor vehicle subject to Part 5 (commencing with Section 43000) of Division 26 of the Health and Safety Code, a valid certificate of compliance issued in accordance with Section 44015 of the Health and Safety Code. The department shall develop a schedule under which vehicles shall be required biennially to obtain certificates of compliance.

(b) The Department of VEHICLE INSPECTION AND REPAIR Consumer Affairs may exempt designated classifications of motor vehicles from subdivision (a) pursuant to Section 44011 of the Health and Safety Code. PROCESSING OF SUCH EXEMPTIONS SHALL BE CONSISTENT WITH THE REQUIREMENTS OF SECTION 44011.5 OF PART 5 OF DIVISION 26 OF THE HEALTH AND SAFETY CODE.

(c) The Department of VEHICLE INSPECTION AND REPAIR Consumer Affairs shall provide the department with information on program area boundaries and vehicle classes that are subject to the motor vehicle inspection and maintenance program.

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24007. (b)(1) No person shall sell, or offer or deliver for sale, to the ultimate purchaser OR TO ANY SUBSEQUENT PURCHASER a new or used motor vehicle, as those terms are defined in Chapter 2 (commencing with Section 39010) of Part 1 of Division 26 of the Health and Safety Code, subject to Part 5 (commencing with Section 43000) of the Division 26 which is not in compliance with the provisions of that Part 5 and the rules and regulations of the State Air Resources Board, unless the vehicle is either (2) sold to a dealer, or (2) sold for the purpose of being wrecked or dismantled.

(2) PRIOR TO OR AT THE TIME OF DELIVERY FOR SALE, THE SELLER SHALL PROVIDE THE PURCHASER A VALID CERTIFICATE OF COMPLIANCE OR CERTIFICATE OF NONCOMPLIANCE, AS APPROPRIATE, ISSUED IN ACCORDANCE WITH SECTION 44015 OF THE HEALTH AND SAFETY CODE.

(3) With each application for initial registration of a new motor vehicle or transfer of registration of a motor vehicle subject to that Part 5 a dealer THE PURCHASER, OR HIS OR HER AUTHORIZED REPRESENTATIVE, shall transmit to the Department of Motor Vehicles a valid certificate of compliance OR NONCOMPLIANCE, AS APPROPRIATE, ISSUED IN ACCORDANCE WITH SECTION 44015 OF THE HEALTH AND SAFETY CODE. from a licensed motor vehicle pollution control device installation and inspection station indicating that the vehicle is properly equipped with a certified device or devices which are in proper operation condition and which are in compliance with the provisions of that Part 5 and the rules and regulations of the state board.

(4) NOTWITHSTANDING THE REQUIREMENTS OF (B)(2) AND (B)(3) ABOVE, with respect to new vehicles certified pursuant to Chapter 2 (commencing with Section 43100) of Part 5 of Division 26 of the Health and Safety Code, a dealer may transmit, in lieu of a certifiacate of compliance, a statement, in a form and containing information deemed necessary and appropriate by the Directory of Motor Vehicles and Executive Officer of the State Air Resources Board, to attest to the vehicles compliance with the provisions of that Chapter 2. The statement shall be certified under penalty of perjury, and shall be signed by the dealer or the dealer's authorized representative.

sierra research

A Study of Excess Motor Vehicle Emissions – Causes and Control

Section X

Assessment of Options for a Post-1990 I/M Program

prepared for:

State of California
Air Resources Board

prepared by:

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SECTION X

A STUDY OF EXCESS MOTOR VEHICLE EMISSIONS - CAUSES AND CONTROL

Assessment of Options for a Post-1990 I/M Program

prepared for:

California Air Resources Board

December 1988

prepared by:

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A STUDY OF
EXCESS MOTOR VEHICLE EMISSIONS -
CAUSES AND CONTROL

Assessment of Options
for a Post-1990 I/M Program

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A STUDY OF
EXCESS MOTOR VEHICLE EMISSIONS -
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Assessment of Options
for a Post-1990 I/M Program

1. SUMMARY

Based on an assessment of several different options for a post-1990 I/M program, the following conclusions and recommendations have been developed:

1. Technology differences may not be a good basis for determining Smog Check inspection intervals. Establishing different Smog Check inspection intervals based on technology differences could be considered. Vehicles equipped with Multi-Port Fuel Injection (MPFI) systems tend to have lower failure rates than vehicles equipped with carburetors or Throttle-Body Fuel Injection systems. However, the failure rates for MPFI vehicles are sufficiently high that a minimum inspection interval of two years should be maintained. In addition, there are serious questions of political feasibility associated with requiring greater inspection frequency for the owners of older vehicles.

2. Smog Check program effectiveness would be improved with the addition of more functional checks. The addition of functional checks of oxygen sensors and feedback control systems would be a valuable enhancement to the Smog Check program. Defects in these areas are a significant source of excess emissions in late-model vehicles. Significant emission reductions may also be associated with Test Analyzer System changes that require mechanics to record the codes stored in On-board Diagnostic systems.

3. Information obtained during in-use surveillance and random roadside testing can be used to enhance the effectiveness of the Smog Check program. Certification and in-use surveillance test results do not appear to be good predictors of Smog Check failure rates. "Pattern failures" need to be eliminated and I/M test procedures need to be improved before any serious consideration of determining inspection frequency based on marginal performance during

certification testing. However, defective components identified during in-use surveillance or random roadside test programs can be used to enhance the effectiveness of the I/M program when the next generation of Test Analyzer Systems is put into service. The new TAS is being designed to store vehicle-specific information. When the new TAS is available, mechanics can be prompted to inspect for frequently occurring defects uncovered during in-use surveillance or random roadside testing.

4. Loaded mode testing offers significant potential for increasing the identification of excess emissions in late-model vehicles. There is also some potential for the incorporation of NOx testing without dynamometers through the use of a "torque converter load" test that is currently under investigation under a separate contract with the Bureau of Automotive Repair. If cost-effective procedures can be developed, ARB should support the implementation of loaded mode testing, especially for areas requiring NOx reductions.

5. Beyond the heavy-duty vehicles already under consideration, there appears to be little potential for achieving significant emission reductions by adding additional mobile source categories to the Smog Check program. Except for motorcycles, the other categories of the mobile source inventory are unregulated. In these unregulated categories, there is no "tampering" with emission control systems to contribute to increased emissions. In addition, many of the unregulated categories (aircraft, trains, construction equipment, etc.) are believed to be better maintained than the average passenger car or light truck. Either retrofit or low emissions adjustment programs would appear to be more effective than conventional I/M for such source categories. Low emission adjustment (injection retard) for train engines and Diesel-powered construction equipment appears to have the greatest potential.

2. INTRODUCTION

Under its contract with ARB for "A Study of Excess Motor Vehicle Emissions - Causes and Control" (ARB Contract No. A5-188-32), Sierra Research and subcontractor Radian Corporation have investigated a number of possible enhancements to California's vehicle inspection and maintenance (I/M) program (called Smog Check). Under Task 2 of the contract, the potential for adding heavy-duty gasoline vehicles to the Smog Check program was addressed. Under Task 3, numerous improvements to the Test Analyzer Systems used in Smog Check stations were recommended. Under Task 7, Sierra studied the problem of "pattern failures" (vehicles that fail Smog Check that have nothing wrong with them other than design characteristics that are incompatible with Smog Check test procedures) and recommended ways to minimize pattern failures in the future. Under Task 8, Sierra drafted a comprehensive set of legislation amendments that would make 25 basic changes to the Smog Check program agreed to by the California I/M Review Committee. (Those amendments were accepted by State Senator Robert Presley who is carrying a bill to reauthorize and improve the Smog Check program.)

An assessment of additional options for a post-1990 I/M program was Task Number 9 of the Scope of Work under the contract. The following six subtasks were outlined in the scope of work:

1. Investigation of the potential for alternative I/M requirements for 1990 and later model vehicles;

2. Investigation of the feasibility of targeting specific engine families for inspection based on the results of certification tests, in-use surveillance tests, random roadside tests, or other available data;

3. Development of alternative concepts for incorporating NOx testing into the I/M program;

4. Development of a rough estimate of the potential benefits of expanding the range of vehicles included in the I/M program;

5. Assisting the 1990's subcommittee of the I/M Review Committee with recommendations and support related to the development of improved test equipment for future use in Smog Check stations; and

6. Development of cost/effectiveness estimates for changes considered under each of the other subtasks.

Subtask 5 (assistance regarding improved test equipment) was completed earlier and incorporated in the Task 3 report ("A Study of Excess Motor Vehicle Emissions - Causes and Control, Task 3 Report, Evaluation of 'Expert Systems' and Test Analyzer System Enhancements for the California Smog Check Program," January 12, 1988). Comments on cost and effectiveness (subtask 6) are integrated into the other subtasks where they are relevant.

Following this introductory section, Section 3 discusses possible alternative I/M requirements that could be considered for late-model vehicles (subtask 1). Section 4 addresses the potential benefits of using "selective I/M" to increase the inspection frequency for vehicles that are most likely to have emissions-related defects (subtask 2). Section 5 summarizes the progress that has been made to date in the development of NOx testing procedures (subtask 3). Finally, Section 6 summarizes the potential benefits of extending I/M requirements to other vehicle categories (subtask 4).

3. ALTERNATIVE REQUIREMENTS FOR LATE-MODEL VEHICLES

Under the subtask related to alternative I/M requirements for 1990 and later model vehicles, Sierra considered different inspection intervals, alternative test procedures (e.g., loaded mode), and alternative functional checks (using the onboard diagnostic system).

Different Inspection Intervals

To investigate the feasibility of different inspection intervals for different types of technologies, Sierra analyzed Test Analyzer System data to determine how the failure patterns might differ for vehicles that are most representative of the technology expected to be prevalent for 1990 and later models.

The same basic technology categories considered in Sierra's previous work for the I/M Review Committee ("Evaluation of the California Smog Check Program - Technical Appendix," Sierra Research, Inc., April 1987) were addressed. However, only vehicles equipped with 3-way catalysts were considered because an I/M program for the 1990s must be focused on these vehicles. In addition, the analysis was restricted to 1981-1984 models to ensure that a reasonable amount of mileage was accumulated on the vehicles. The following 21 categories were analyzed:

1. All carbureted vehicles
   - 1.1 Carbureted vehicles without air injection
     - 1.1.1 Carbureted vehicles without air injection or EGR
     - 1.1.2 Carbureted vehicles w/o air injection with EGR
   - 1.2 Carbureted vehicles with air injection
     - 1.2.1 Carbureted vehicles with air injection, no EGR
     - 1.2.2 Carbureted vehicles with air injection and EGR
2. All Throttle Body Injection (TBI) vehicles
   - 2.1 TBI vehicles without air injection
     - 2.1.1 TBI vehicles without air injection or EGR
     - 2.1.2 TBI vehicles without air injection with EGR
   - 2.2 TBI vehicles with air injection
     - 2.2.1 TBI vehicles with air injection, no EGR
     - 2.2.2 TBI vehicles with air injection and EGR
3. All Multi-Port Fuel Injection (MPFI) vehicles
   - 3.1 MPFI vehicles without air injection
     - 3.1.1 MPFI vehicles without air injection or EGR
     - 3.1.2 MPFI vehicles without air injection with EGR
   - 3.2 MPFI vehicles with air injection
     - 3.2.1 MPFI vehicles with air injection, no EGR
     - 3.2.2 MPFI vehicles with air injection and EGR

The basic approach was to determine whether Smog Check test results might indicate significantly different in-use performance for specific technology combinations. ARB staff had indicated a specific interest in evaluating whether vehicles most representative of expected 1990 and later models (i.e. MPFI without air injection) might be demonstrating sufficiently superior performance during Smog Checks that extended inspection intervals could be considered. (Vehicle age and mileage corrections were not investigated.)

The analysis was not straightforward because information contained in the Test Analyzer System (TAS) records does not include a full description of the emission control system installed on the vehicle. In addition, our previous work with TAS data has shown that there is a high percentage of erroneous entries by Smog Check mechanics. To identify the various technology categories, Sierra used its proprietary data cleaning and screening program on a large sample of TAS records obtained from the Bureau of Automotive Repair (BAR). The program was used to cull out all impossible combinations of make, model year, engine size, and emission control system configuration. This program utilizes all EPA certification records for 1974 and later models certified for sale anywhere in the U.S. Once all obviously invalid records were eliminated, Sierra developed new software to identify all combinations of make, model year, engine size, and emission control system configuration that were unique to each of the technology categories under investigation.

Appendix A contains the detailed results of the analysis. Nineteen different data summaries are presented. Two of the technology combinations (carburetor/no AIR/no EGR and TBI/AIR/no EGR) could not be identified. The information contained in the appendix is in the standard form that we have used in previous reports to ARB summarizing TAS test results. One of the nineteen printouts from the appendix (for all carbureted vehicles) is reproduced on the following page.

Since the analysis was restricted to "initial" test results, there are no data presented for any after-repair tests or referee tests. The data included in the appendix show the measured tailpipe emissions for passing and failing vehicles separately, as well as the average emissions for all tests. Underhood and functional inspection results are also presented. A brief explanation of the information found in the printouts contained in the appendix follows.

Record Counts - "Test Records Processed" indicates the total number of valid tests that were analyzed. As indicated on the printout for the 1987 models, 458 test results were included in the sample. "Initial Test Records" indicates the number of tests that were recorded as the first test of a particular vehicle. "After Repair Test Records" and "Referee Test Records" were not analyzed.

Average Odometer Reading - The results listed under this heading show the average odometer readings for all test records included in the analysis. The "All Vehicles" and "Initial Test Vehicles" values are the same because "After Repair Test Vehicles" and "Referee Test Vehicles" were not considered.

VEHICLES WITH CARB
CALIFORNIA I/M SUMMARY STATISTICS

26-APR-1988

Record Counts

Test Records Processed:	89830
Initial Test Records:	89830
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	58179
Initial Test Vehicles:	58179
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.9	28.1	--	--	2.9	26.7	1.5	25.2	1.4	6.2	10.6
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle CO (%)	Idle HC (ppm)	Idle RPM	2500 CO (%)	2500 HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.35	78	836	0.58	61	2501
Initial Test - Pass Vehicles	0.04	29	834	0.16	30	2501
Initial Test - Fail Vehicles	1.13	202	838	1.65	139	2499
Initial Test - Underhood Fail Only	0.05	33	837	0.18	31	2502
Initial Test - Tailpipe Fail Only	1.16	206	839	1.70	142	2499
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.7
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.1	0.5	0.2	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	1.3
Pass	99.7	92.7	82.7	99.8	99.8	16.0	84.0	97.6	96.4	74.9	97.2	65.8	100.0
N/A	0.2	6.8	17.1	0.1	0.1	84.0	16.0	2.2	3.6	25.1	2.7	34.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	79.0	57.2	56.1	89.7
Fail	0.6	0.4	1.2	2.1
N/A	20.4	21.3	21.6	37.8

Pass/Fail Percentages - Under this heading, the percent of vehicles which passed or failed the I/M test is displayed. In addition, the information indicates how vehicles failed the test.

Average Emission Levels - Under this heading, tailpipe emission levels are reported for various subcategories. In the first row, the initial test results for all vehicles are presented. The second row under this heading shows that the average emission levels for vehicles that passed the test were much lower. The third row shows that failing vehicles had much higher emissions.

Repair Action Percentages and Average Repair Costs - These entries are all blank because only initial test results were considered.

Observed Tampering Pattern - Visual Inspection Percentages - Under this heading the results of the visual inspection results for the initial test only are summarized. There are twelve visual inspection categories:

"PCV" means positive crankcase ventilation system;

"TAC" means thermostatically controlled air cleaner;

"AIR" means air injection system;

"FEC" means fuel evaporative controls;

"FIL" means fillpipe lead restrictor;

"OXC" means oxidation catalyst;

"3WC" means three-way catalyst or three-way plus oxidation catalyst;

"EGR" means exhaust gas recirculation;

"ISC" means ignition/spark controls;

"CLP" means closed-loop control system;

"CFI" means carburetor or fuel injection system; and

"OTH" means other.

The "ANY" category indicates the percentage of vehicles that had defects in one or more of the categories.

For each of the categories, there are six values:

"DISC" indicates the percentage of vehicles that had "disconnected" emission control devices in a particular category;

"MOD" indicates the percentage of "modified" emission control devices;

"MISS" indicates the percentage of "missing" emission control devices;

"TOTL" indicates the sum of disconnected, modified, and missing devices;

"PASS" indicates the percentage of vehicles that passed the visual inspection of a particular type of device; and

"N/A" indicates the percentage of vehicles that were not factory-equipped with a particular type of device.

Functional Check Percentages - Under this heading, there are three categories:

"EWL" means engine warning lights;

"IGT" means ignition timing; and

"EGR" means exhaust gas recirculation.

The results of the functional check may be either "pass", "fail", or "not applicable" (N/A). The functional check percentages do not always add up to 100% because functional checks of timing and EGR are not performed in all areas of the state. As in the case of visual inspections, none of the vehicles in the sample failed any of the functional tests.

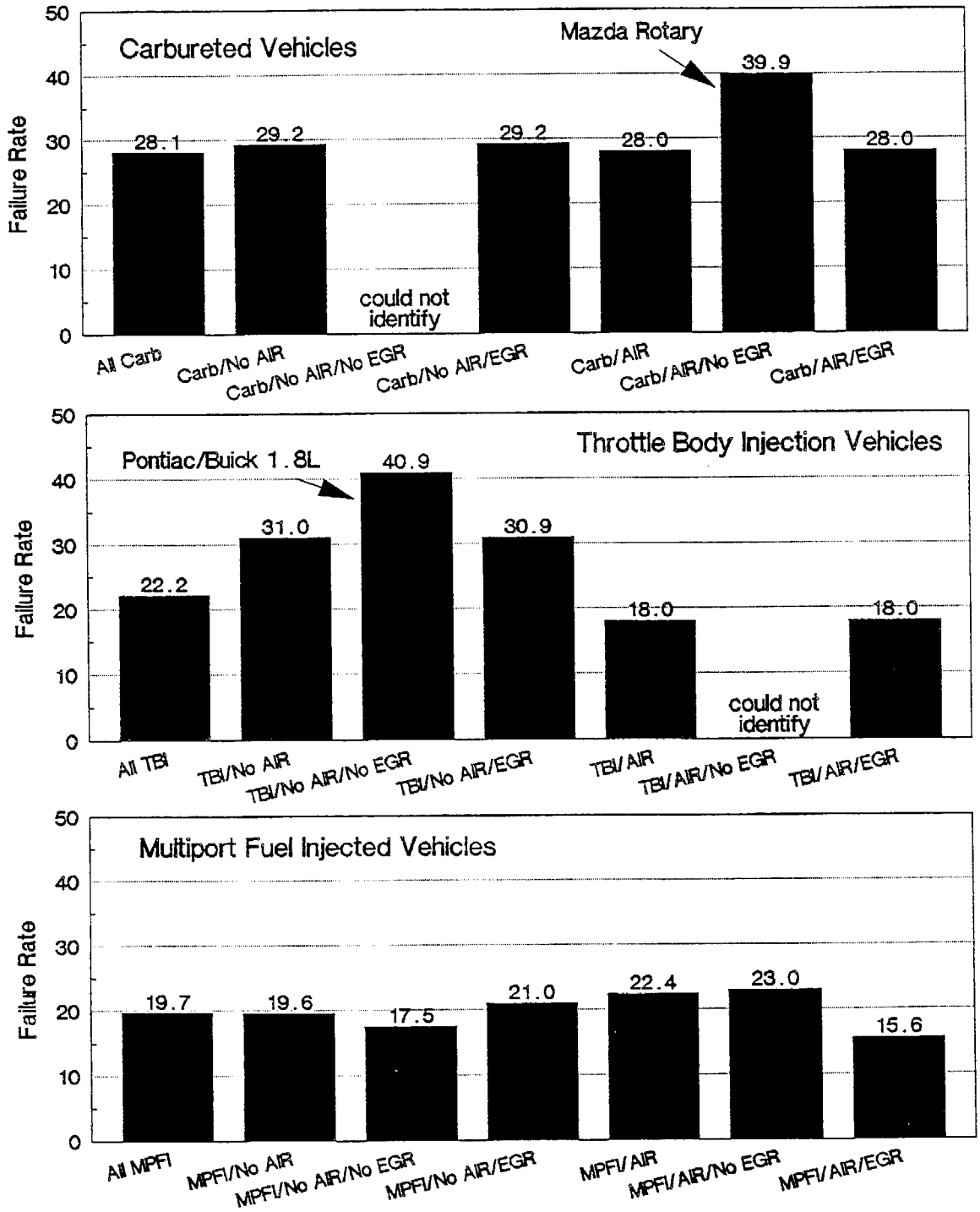
The results of the technology-specific TAS data analysis are summarized in Figure 1. As the figure shows, the MPFI-equipped vehicles tend to have somewhat lower failure rates. As the ARB staff expected, the carbureted vehicles in the sample had higher failure rates. Inspection of the data contained in Appendix A will indicate that the average mileage on the carbureted vehicles was not significantly higher than for the fuel-injected vehicles. Overall, the carbureted vehicles had about 50% higher failure rates than the MPFI vehicles.

Figure 1 also shows that certain technology combinations within the carbureted and TBI categories had significantly higher failure rates. However, detailed analysis of the raw data indicated that the two highest failure rates were associated with two specific engine families. The Mazda rotary engine vehicles and the Pontiac/Buick 1.8 litre vehicles were in the 40% failure rate range.

Based on the results of the analysis, it is not clear that different inspection intervals can be justified based solely on technology differences. Even the MPFI vehicles are experiencing significant (≈20%) failure rates. Extending the inspection interval beyond two years for these vehicles would be difficult to justify given this

Figure 1

Smog Check Failure Rates By Technology Category (1981–84 Models)



level of failure. Perhaps a case can be made for increasing the inspection interval for carbureted vehicles, but the political feasibility of such a move is questionable. In addition, the fact that the highest failure rates were associated with specific engine families suggests that alternative criteria may be preferred. It also should be noted that relatively high failure rates for certain vehicle categories may not remain constant over time. Certain vehicles may experience more severe deterioration at high mileage although they had relatively low failure rates initially. Other vehicles may improve over time as the problems that led to relatively high failure rates at low mileage are resolved through recall.

Alternative Inspection Procedures

Because 1990 and later models will all be equipped with on-board diagnostic (OBD) systems, there is significant potential for improving the effectiveness of the Smog Check program through test procedure changes that utilize the OBD systems. In the earlier report submitted under Task 3 ("A Study of Excess Motor Vehicle Emissions - Causes and Control, Task 3 Report, Evaluation of 'Expert Systems' and Test Analyzer System Enhancements for the California Smog Check Program," January 12, 1988), Sierra suggested a number of new requirements for utilizing the OBD system during the inspection and repair process. Specifically, we suggested that mechanics be required to "pull the codes" from the onboard computer and enter them into the TAS. In addition, the results of previous ARB research into the types of failures showing up on MPFI vehicles indicate that functional tests of oxygen sensors and catalysts would be beneficial. Defective oxygen sensors and catalysts were shown to be a significant source of excess emissions under the recently completed "MPFI Study" conducted for ARB by Radian.

Oxygen sensor function could be monitored while the feedback control system is driven to the rich and lean limits by alternatively applying zero and 1 volt to the oxygen sensor leads while the voltage output of the sensor is monitored. Simultaneous measurement of exhaust emissions could determine whether the feedback control system is responding properly to the input voltage. The catalyst test would involve the measurement of exhaust emissions while the voltage to one spark plug is interrupted. The amount of emissions increase would determine whether the catalyst is efficiently converting HC and CO emissions to carbon dioxide and water vapor. Because of the potential for inducing defects through the performance of functional inspections that involve the disconnection of wires, it may be advisable to implement oxygen sensor and catalyst checks only for vehicles which either fail the tailpipe standards or have engine warning lights illuminated. Supplemental sensor tests would be vehicle specific and would generally involve voltage and resistance measurements across the terminals of various sensors. These new procedures would be most efficiently implemented in conjunction with TAS changes. Our Task 3 report addresses how the TAS might be modified in more detail. That report also addresses the cost effectiveness of potential changes to the TAS.

Loaded mode testing is another alternative that may be particularly effective as a Smog Check program enhancement for 1990 and later models. Loaded mode testing is particularly well-suited to identifying "lean" failure modes in computer-controlled vehicles. When the feedback control system fails and defaults to leaner than stoichiometric operation, the vehicle may still easily pass HC and CO emission standards. Loaded mode testing should be capable of detecting the loss in NOx control associated with such failures. Section 5 of this report discusses the progress that has been made in developing a loaded mode test for the Smog Check program.

4. SELECTIVE I/M

Targeting specific engine families for inspection is an appealing notion because of the potential to concentrate on subgroups within the vehicle population that are most likely to contain emissions-related defects that could be corrected under an I/M program.

As discussed in Section 3, there appears to be rather limited potential for increasing I/M inspection intervals based solely on technology differences. This section of the report covers our efforts to determine whether problem vehicles might be detected through alternative means. The use of certification data, in-use surveillance data, and random roadside inspection data was considered.

Tables 1, 2, and 3 were constructed from a large sample of TAS records obtained from BAR. As the tables show, there are significant differences in the Smog Check test results for different manufacturers. The difference between manufacturers substantially exceeds the differences due to technology illustrated earlier. For the more recent model years, the difference in the overall failure rate between manufacturers is sometimes more than an order of magnitude. For example, the tailpipe failure rate for 1983 model Saab vehicles was 0.0% while 1983 model Mitsubishi vehicles experienced a 43.8% failure rate.

It should be noted that the manufacturer-specific differences are confounded by "pattern failures". As covered in our report under Task 7 of the contract ("A Study of Excess Motor Vehicle Emissions - Causes and Control, Task 7 Report, Investigation of 'Pattern Failure' Vehicles in the California I/M Program"), numerous models contain design features that result in high Smog Check program failure rates even when the emission control system is functioning as designed.

Certification Data

In order to determine whether the certification performance of an engine family would be a good predictor of Smog Check performance, Sierra compared the certification emission levels and Smog Check failure rates for seven different manufacturers (GM, Ford, Nissan, Toyota, Honda, Volvo, and Saab). The 1983 model year was selected for the analysis. Average certification results are listed in Appendix B.

Table 1

Manufacturer Specific Overall Failure Rates
1974-1987 Models

Manufacturer	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	All Model Years
Mitsubishi	55.5	57.4	72.5	62.9	58.0	49.1	72.5	50.7	51.3	43.8	40.0	36.8	17.4	12.9	41.7
American Motors	58.0	52.4	46.2	35.2	33.6	36.7	41.9	42.2	26.1	31.2	34.1	23.4	17.3	*	41.3
Ford	40.2	54.4	50.6	48.9	46.8	43.2	45.3	45.8	47.1	35.3	30.8	27.9	30.4	15.2	39.9
Volkswagen	42.9	53.3	53.8	54.2	53.1	47.7	57.6	41.8	27.8	24.7	20.0	9.9	6.9	4.1	37.9
General Motors	36.7	45.4	42.9	40.1	41.3	34.2	49.8	36.2	34.2	26.9	23.7	20.0	16.9	12.1	32.9
Audi	38.3	51.5	52.6	58.5	49.4	55.4	51.9	43.7	22.4	13.6	11.1	4.0	7.6	*	32.5
Chrysler	48.2	53.7	50.0	46.0	39.2	31.6	45.5	34.6	29.3	26.5	19.4	11.6	13.1	11.1	31.9
Nissan	46.3	47.4	43.2	40.2	32.9	28.8	32.5	40.3	37.2	42.7	32.2	22.0	15.5	11.8	31.7
Toyota	35.1	54.2	40.8	43.1	38.6	32.1	35.4	48.1	36.9	29.6	21.2	18.6	13.9	10.5	29.9
Porsche	24.5	34.8	31.3	39.9	42.1	39.1	47.7	34.3	20.7	19.1	8.6	10.5	7.9	*	27.9
Yugo	--	--	--	--	--	--	--	--	--	--	--	--	29.2	26.3	27.4
Mazda	42.3	50.0	34.5	57.8	49.4	43.4	44.3	51.1	43.2	29.3	15.5	9.1	7.8	3.9	27.2
Mercedes Benz	25.0	49.7	41.2	34.0	35.2	35.5	34.6	48.7	33.3	27.1	16.2	11.8	4.3	3.6	23.2
Honda	48.7	42.7	34.7	25.6	26.4	24.9	22.3	22.6	24.2	23.5	21.7	20.0	13.8	10.9	22.1
Peuguot	*	*	*	*	*	*	*	*	*	17.9	14.3	14.6	*	*	21.0
BMW	48.7	40.7	38.4	26.0	19.5	20.5	26.9	26.1	31.6	21.3	18.2	10.4	3.3	1.4	20.9
Volvo	26.5	26.8	32.8	37.7	38.0	34.7	22.4	23.5	20.1	17.7	6.0	2.6	2.9	0.0	18.7
Hyundai	--	--	--	--	--	--	--	--	--	--	--	--	23.8	17.0	17.5
Saab	*	*	*	*	40.0	29.2	48.0	15.8	20.7	4.1	6.5	6.3	3.4	*	16.7

Table 2

Manufacturer Specific Tailpipe Failure Rates (%)
1974-1987 Models

Manufacturer	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	All Model Years
Mitsubishi	44.5	54.4	69.1	59.7	50.0	43.9	69.6	47.0	50.2	43.8	38.6	35.7	16.3	12.9	39.5
Ford	28.6	48.2	43.2	41.7	40.3	36.9	40.4	43.4	45.1	33.8	30.1	27.1	29.9	14.9	35.9
American Motors	45.6	46.3	40.5	24.2	26.2	27.3	38.0	40.2	21.7	27.5	34.1	23.4	17.3	*	34.7
Volkswagen	35.8	48.2	47.5	48.7	47.6	44.1	56.8	40.1	25.5	19.7	18.2	7.2	5.0	4.1	34.1
Audi	33.3	50.0	50.0	56.9	43.1	49.5	51.6	42.5	21.0	10.2	7.7	3.0	4.1	*	29.8
General Motors	26.5	38.3	35.9	31.7	33.1	26.9	46.4	32.8	32.1	25.3	22.7	19.4	16.6	12.0	28.8
Nissan	38.2	39.7	39.0	31.5	27.0	21.9	29.7	38.5	36.3	41.3	30.0	18.4	12.8	11.2	28.2
Chrysler	38.2	47.3	44.4	38.6	33.5	25.7	40.8	31.2	26.9	24.7	18.5	10.9	12.7	11.0	28.0
Toyota	26.7	49.9	35.1	38.0	33.4	26.0	30.8	45.7	36.1	28.7	20.3	18.1	13.7	10.4	27.6
Porsche	23.8	32.6	30.3	33.5	39.2	34.8	45.9	34.3	20.7	19.1	8.6	10.5	7.9	*	26.1
Yugo	--	--	--	--	--	--	--	--	--	--	--	--	25.0	26.3	25.8
Mazda	41.2	50.0	32.8	53.3	43.7	41.9	40.8	49.4	42.4	27.9	14.1	7.9	7.1	3.6	25.7
Honda	41.7	39.9	32.6	23.8	23.7	22.7	20.2	21.2	23.0	22.8	21.5	19.9	13.7	10.9	21.0
Mercedes-Benz	21.5	47.8	31.8	27.2	30.9	32.5	28.3	46.2	28.1	25.2	15.5	11.3	3.7	3.6	20.7
Peuguot	*	*	*	*	*	*	*	*	*	17.9	12.5	14.6	*	*	18.9
BMW	42.5	33.3	28.1	20.2	12.6	13.5	26.3	26.1	30.6	20.7	17.3	10.2	3.3	1.4	18.5
Volvo	20.6	22.2	24.7	32.5	35.8	31.3	22.1	20.8	19.3	15.4	5.4	2.6	2.1	0.0	16.6
Hyundai	--	--	--	--	--	--	--	--	--	--	--	--	21.5	16.4	16.4
Saab	*	*	*	*	40.0	29.2	44.0	15.8	10.3	0.0	3.2	5.0	1.7	*	14.3

Table 3

Manufacturer Specific Underhood Failure Rates
1974-1987 Models

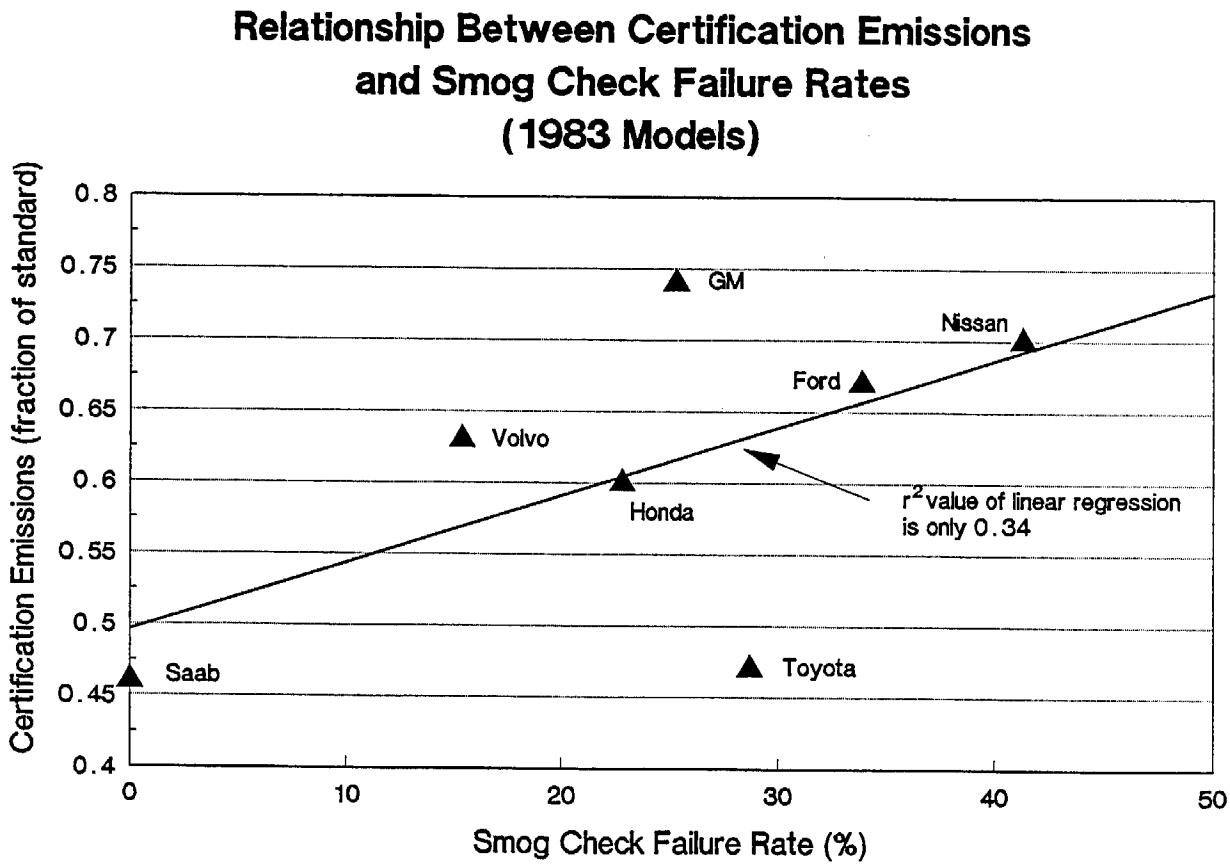
Manufacturer	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	All Model Years
American Motors	29.6	22.0	20.5	21.8	13.9	12.0	12.8	4.9	7.2	6.4	0.0	0.0	0.0	*	15.9
Ford	20.6	20.4	18.8	18.2	16.0	14.1	12.6	7.9	6.7	3.6	1.4	1.1	0.7	0.4	9.8
Chrysler	22.5	17.6	17.4	17.0	12.9	11.8	10.7	7.2	5.2	2.9	1.6	0.9	0.6	0.2	9.0
General Motors	17.6	16.1	14.8	16.1	16.0	13.2	9.9	7.7	4.6	3.2	1.6	0.9	0.5	0.2	8.4
Volkswagen	14.4	16.4	14.0	13.3	12.4	10.6	3.7	3.1	4.0	5.7	1.8	2.7	1.9	0.0	7.9
Nissan	17.7	16.8	11.6	15.9	11.6	10.2	6.0	4.6	2.9	4.0	3.6	4.4	3.2	0.7	6.5
Mitsubishi	27.3	17.6	14.2	18.8	18.4	11.7	14.1	7.6	5.7	1.8	3.2	2.0	1.3	0.0	6.4
Audi	16.7	7.6	11.8	15.4	13.1	10.9	2.8	2.3	1.4	3.4	3.3	1.0	3.4	*	5.5
Toyota	12.9	12.3	11.3	12.8	11.5	10.7	8.6	6.3	2.5	1.7	1.4	0.8	0.3	0.3	4.8
Porsche	2.7	3.3	10.1	10.8	10.5	10.9	3.7	1.5	0.0	1.8	0.0	0.0	0.0	*	4.7
Mercedes-Benz	6.3	8.8	17.6	12.9	6.1	7.1	8.7	8.5	5.9	1.9	0.7	0.5	0.6	0.0	4.6
BMW	15.9	18.5	15.8	8.2	9.8	8.3	0.9	0.0	1.0	0.9	1.4	0.2	0.0	0.0	3.7
Peuguot	*	*	*	*	*	*	*	*	*	0.0	1.8	0.0	*	*	3.7
Mazda	4.1	0.0	12.1	6.7	12.6	4.2	8.8	4.5	2.3	3.3	1.6	1.4	0.8	0.4	3.1
Volvo	8.8	7.7	12.6	7.3	3.6	5.2	1.5	3.0	1.4	2.3	0.6	0.0	0.8	0.0	3.1
Saab	*	*	*	*	0.0	0.0	4.0	*	10.3	4.1	3.2	1.3	1.7	*	2.6
Honda	13.0	4.9	6.6	3.0	3.8	3.4	2.4	1.9	2.2	1.1	0.3	0.2	0.2	0.0	1.7
Yugo	--	--	--	--	--	--	--	--	--	--	--	--	4.2	0.0	1.6
Hyundai	--	--	--	--	--	--	--	--	--	--	--	--	2.3	1.2	1.4

* Insufficient sample size (less than 30 records).

Tailpipe failure rates were taken from Table 2. The results are shown in Figure 2.

As the figure shows, there appears to be some correlation between certification emissions levels (based on the average HC and CO levels compared to the 50-state standards of 0.41 g/mi HC and 3.4 g/mi CO) and the Smog Check failure rate. However, the correlation coefficient was a modest 0.34. In addition, if the Saab vehicles are eliminated, the correlation coefficient drops to 0.05. This indicates almost no correlation.

Figure 2



Fraction of certification standards based on average of HC and CO emissions.

Although this analysis was restricted to only one model year, it has been clearly documented that the correlation between emissions using the official certification test procedures and the idle/2500 rpm I/M test modes is very poor. There would be no reason to expect much correlation between vehicles with relatively high certification emissions and those with relatively low emissions except to the extent that relatively high certification levels happen to be correlated with the amount of deterioration in customer service that can be expected.

The poor correlation between short tests and the certification test procedure would also make it difficult to base Smog Check inspections on the tailpipe emissions performance of vehicles during in-use surveillance testing. However, defective components identified during in-use surveillance or random roadside test programs can be used to enhance the effectiveness of the I/M program when the next generation of Test Analyzer Systems is put into service. The new TAS is being designed to store vehicle-specific information. When the new TAS is available, mechanics can be prompted to inspect for frequently occurring defects uncovered during in-use surveillance or random roadside testing. As noted in our earlier report under Task 3, defects reported by vehicle manufacturers and defects frequently reported by Smog Check mechanics could also be utilized.

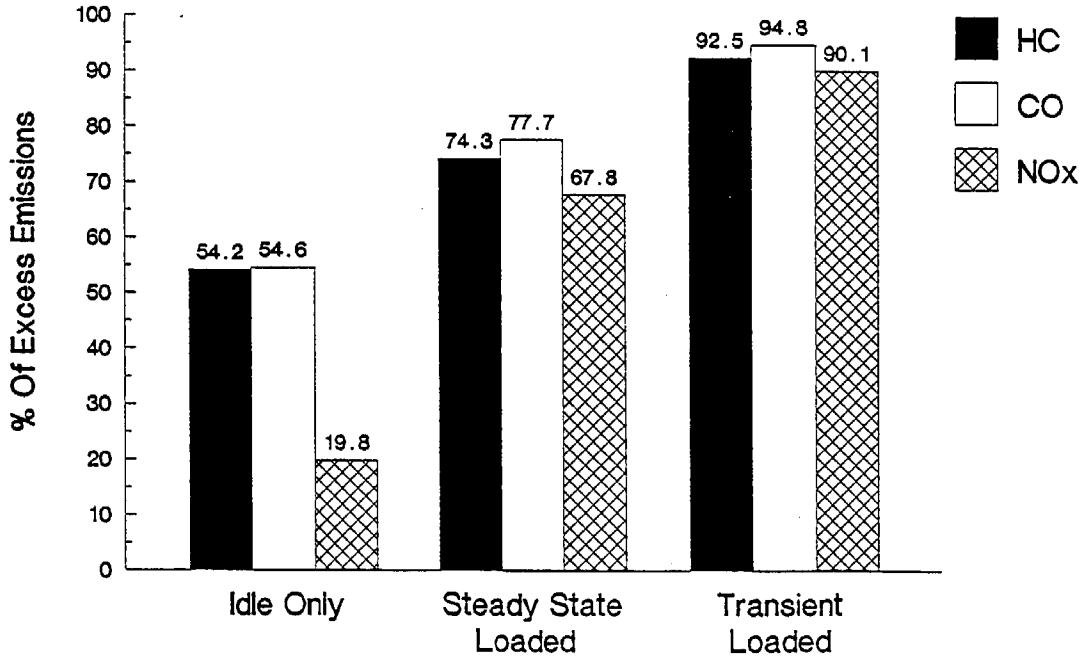
The total number of passenger car and light truck engine families certified in 49-states and California each year is typically less than 400, many of which are very low volume families. Assuming engine-family-specific information was desired for 300 engine families for each model year and twenty model years, 1 kilobyte of information for each family would require about 6 megabytes of data storage. Combined with the other data storage needs of the next generation of Test Analyzer Systems, storing such vehicle-specific information on inexpensive 30 megabyte hard disks appears to be entirely feasible. (Routine TAS updates via floppy disk or modem would obviously be required to maintain up-to-date data bases in each analyzer.) At a minimum, these updates would be required on an annual basis to deal with new configurations certifed each year. Ideally, some of the information available for each family (new recall campaigns, etc.) could be updated more frequently. Updates could occur on an almost continuous basis if BAR is able to communicate with new TAS systems via modems.

5. NOx TESTING

Under an earlier contract for the analysis of data generated during the California I/M Evaluation Program*, Sierra made preliminary estimates of the potential for loaded mode testing. Using the most sophisticated, transient testing procedures, it was demonstrated that over 90% of the excess emissions from the motor vehicle fleet could be identified. The results of the earlier analysis are shown in Figure 3. As the figure shows, loaded mode testing is much more effective than idle tests at identifying excess emissions, especially for NOx.

Figure 3

Excess Emissions Identified by Various Emission Measurement Options



* "Evaluation of the California Smog Check Program, Technical Appendix," Sierra Research, Inc., April 1987.

As shown in our earlier analysis for ARB and the I/M Review Committee, loaded mode testing has the potential to increase the emission reductions from the Smog Check program by about 50%; however, immediate implementation of the most sophisticated loaded mode testing methods would reveal a shortage of mechanics capable of repairing most of the defective vehicles. Many motorists would have to take their vehicles to more than one facility in order to obtain the repairs necessary to pass the test. In addition, the capital cost for the most sophisticated loaded mode testing equipment is about five times higher than the cost of the Test Analyzer Systems used in the current program.

Studies currently underway may show that less expensive loaded mode testing is possible without a sacrifice in performance. In addition, upgraded mechanic qualification criteria should make it possible for more failed vehicles to be repaired promptly. However, it is also possible to achieve further emission reductions through improvements in Test Analyzer Systems and onboard diagnostic systems without loaded mode testing. The optimum testing approach for the future is not yet clear given the mixture of technological, economic, and political factors related to the use of loaded mode testing and improved forms of testing that do not involve chassis dynamometers.

Background

The emissions reductions achieved by the California Smog Check program can be increased through a number of measures including increased enforcement of program requirements and increases in the repair cost ceiling. However, in the immediate future, the fundamental limitation to I/M program improvements is the ability of mechanics to accurately identify defects in late-model vehicles. Because of the relatively poor correlation between the idle emissions test and the Federal Test Procedure (FTP) used to certify new cars and light trucks, the identification of many defects currently depends on the capabilities of mechanics to identify problems through visual and functional inspections of the vehicle and its computer control system.

Even with improved enforcement, it has been estimated ("Evaluation of the California Smog Check Program - Technical Appendix," Sierra Research, April, 1987) that almost half of all defects (both tampering and non-tampering) will escape detection. However, there would still be significantly greater emission reductions if all mechanics did as good a job as they are capable of and if the repair cost ceiling that applies to the program was not a major constraint. The potential for short-term improvements is illustrated in the following table.

Table 4

Estimated Emission Reductions
Due to Short-Term Smog Check Program Improvements

	HC	CO	NOx
Emission Reductions From the Current Smog Check Program	12.3%	9.8%	3.9%
51% Tampering Correction	+12.7%	+ 8.8%	+ 5.2%
51% Non-Tampering Defect Repair	+ 5.6%	+12.0%	+ 3.6%
Total Emission Reduction With I/M Improvements	30.6%	30.6%	12.7%

The improvements shown in the above table are based on an estimate that 51% of all tampering and non-tampering defects would be identified and corrected under an I/M program with higher repair cost ceilings and better enforcement of program requirements. (The emissions benefit of correcting defects was computed based on the theoretical minimum emissions for a perfectly maintained vehicle fleet being equal to the standards the vehicles were certified to meet for HC and CO, and 10% below the standards for NOx.)

If the identification of defects could be improved, further reductions would be possible. Loaded mode testing is one of the options available for improving the identification of emissions-related defects.

Based on an analysis performed for the I/M Review Committee, the most sophisticated loaded mode testing would make it possible to identify over 90% of the excess emissions from vehicles subject to the Smog Check program. Although diagnosis of defects would still be a problem for many mechanics, an effective loaded mode test with stringent constraints on waivers would essentially force vehicle owners to take defective vehicles to repair facilities that are capable of properly repairing them. Table 5 illustrates the potential benefits of loaded mode testing based on a 90% defect identification rate and a 90% success rate on the repair of failing vehicles.

Table 5

Estimated I/M Program Improvements
With Loaded Mode Testing

	HC	CO	NOx
Emission Reductions From the Current Smog Check Program	12.3%	9.8%	3.9%
81% Tampering Correction	+21.4%	+14.8%	+ 9.7%
81% Non-Tampering Defect Repair	+14.9%	+24.0%	+ 6.7%
Total Emission Reduction With Loaded Mode Testing	48.6%	48.6%	20.3%

Loaded Mode Testing Cost/Effectiveness

Increases in the cost of the equipment needed to perform the I/M test would be substantial if the most sophisticated loaded mode testing equipment were used. The increased costs for loaded mode testing equipment capable of simulating transient vehicle operation and measuring NOx emissions in addition to HC and CO are shown in the Table 6. The estimates shown in the table are based on quotes from vendors obtained during the preparation of our report covering the California I/M Evaluation Program.

Table 6

Incremental Costs for Loaded Mode Options

NOx Instrumentation	$ 4,000
TAS Modifications to Interface with Dyno	1,000
Auto-Load-Setting Dynamometer	8,000
Site Preparation Charges (including cooling system)	2,500
Miscellaneous equipment and supplies (cooling fans, etc.)	1,000
Constant Volume Sampling System	25,000
5-Wheel Auto-Select Flywheel Set	8,000
TOTAL	$49,500

To determine how this increased level of cost would affect the overall cost/effectiveness of the Smog Check program, it is helpful to consider the cost and effectiveness of the current program, and what the cost and effectiveness of the program would be with improvements that stop short of loaded mode testing.

Tables 7 and 8 summarize the cost/effectiveness calculations for the current Smog Check program and for an improved program under which the overall effectiveness increases to 51% of the theoretical maximum without the use of loaded mode testing.

Table 7

Cost/Effectiveness of Current Smog Check Program

Costs:

$20 ÷ 2 =	$10	(annual average inspection fee)
+ 6 ÷ 2 =	3	(annual avg. cost for Smog Certificate)
+ ($35 × 0.35) ÷ 2 =	6	(annual avg. repair cost per vehicle)
	$19	(total annual cost per vehicle)
÷	2	(50% of costs assigned to HC + NOx)
	$9.50	(annual cost for HC + NOx control)
	$9.50	(annual cost of CO control)

Emission Reductions:

2.11 g/mi HC × 12.3% =	0.26 g/mi	(HC reduction)
1.55 g/mi NOx × 3.9% =	0.06 g/mi	(NOx reduction)
	0.32 g/mi	(HC + NOx reduction)
×	10,000 miles/year	(annual vehicle mileage)
	7.05 pounds of HC + NOx	(annual reduction)
23.71 g/mi CO × 9.8% =	2.32 g/mi	(CO reduction)
×	10,000 miles/year	(annual vehicle mileage)
	51.10 pounds of CO	(annual reduction)

Cost/Effectiveness:

HC + NOx Cost/Effectiveness Ratio = $9.50 ÷ 7.05 lbs. = $1.35/pound

CO Cost/Effectiveness Ratio = $9.50 ÷ 51.10 lbs. = $0.19/pound

Table 8

Cost/Effectiveness of Improved Smog Check Program
Without Loaded Mode Testing

Costs:

$30 ÷ 2 =	$15	(annual average inspection fee)
+ 6 ÷ 2 =	3	(annual avg. cost for Smog Certificate)
+ ($100 × 0.35) ÷ 2 =	17.50	(annual avg. repair cost per vehicle)
	$35.50	(total annual cost per vehicle)
÷	2	(50% of costs assigned to HC + NOx)
	$17.75	(annual cost for HC + NOx control)
	$17.75	(annual cost for CO control)

Emission Reductions:

2.11 g/mi HC × 30.6% =	0.65 g/mi	(HC reduction)
1.55 g/mi NOx × 12.7% =	0.20 g/mi	(NOx reduction)
	0.85 g/mi	(HC + NOx reduction)
×	10,000 miles/year	(annual vehicle mileage)
	18.72 pounds of HC + NOx	(annual reduction)

23.71 g/mi CO × 30.6% =	7.26 g/mi	(CO reduction)
×	10,000 miles/year	(annual vehicle mileage)
	159.91 pounds of CO	(annual reduction)

Cost/Effectiveness:

HC + NOx Cost/Effectiveness Ratio = $17.75 ÷ 18.72 lbs. = $0.95/pound

CO Cost/Effectiveness Ratio = $17.75 ÷ 159.91 lbs. = $0.11/pound

Notes: Cost for inspections is estimated to increase to approximately $30 due to the cost of new analyzers and the additional time required for mechanics to perform more thorough inspections.

Average repair cost for improved I/M programs is expected to increase to about $100, reflecting an increase in repair work.

Calculations assume immediate implementation of program improvements. Cost/Effectiveness ratio rises as fleet turnover occurs and average emissions are reduced but is expected to remain below $3/lb. of HC + NOx for at least ten years.

The baseline emissions on which Tables 7 and 8 are based were taken from the earlier report on "Evaluation of the California Smog Check Program." The differences between Table 7 and Table 8 indicate that increased inspection costs and increased repair costs are associated with an upgraded Smog Check program under which mechanics perform at their current level of capability. However, the ratio of cost to effectiveness actually improves from $1.35 per pound of HC plus NOx control to $0.95.

To estimate the effects of loaded mode testing using the most sophisticated equipment, the worst case (i.e., highest cost) assumption would be that most currently licensed Smog Check stations get involved in loaded mode testing. If 8,000 stations are involved in the program and there are 1,000,000 tests per month, the increased cost per test associated with the amortization of a $50,000 investment for each station would be about $9 (computed using a 10% cost of funds and a 5-year amortization period). With maintenance and operating cost of the loaded mode testing equipment estimated at 33% of the capital cost, the total increase in the test fee associated with the additional equipment would be about $12. However, if the time required to conduct the test increased by about 50%, the total inspection cost would be increased by another $15. (Test time would increase due to the addition of requirements to prepare and secure the vehicle for dynamometer testing. For the most sophisticated dyno test, tire pressures would have to be raised, the safety inspection would have to be more thorough, the connection required for exhaust sampling would be more complicated, and the exhaust sampling period would also be longer.) Repair cost would also be expected to increase because the failure rate would increase to about 50%. The effect that these cost increases and the increase in emission reductions would have on the cost/effectiveness of the program is shown in Table 9. The extent to which the cost/effectiveness of loaded mode testing is related to the repair cost ceiling was not evaluated. However, it is clear that emission reductions for the correction of some additional defects identified by loaded mode testing would require repair costs in excess of $50 per vehicle. Additional tampering would continue to be corrected even if the repair cost ceiling were not raised.

As Table 9 shows, the cost/effectiveness ratio of the program would stay about the same under the loaded mode testing scenario considered, while the emissions reductions would be substantially increased. However, the scenario addressed above represents a very idealized case. There are several potential problems with loaded mode testing that need further study.

Potential Problems With Loaded Mode Testing

The cost/effectiveness estimates computed in Table 9 are based on the assumption that the Smog Check station that first tests the vehicle will be able to identify and correct the defect. This is not a very good assumption based on the current state of Smog Check mechanics' abilities to diagnose defects in computer-controlled vehicles. It is possible for loaded mode testing to prevent defective vehicles from

Table 9

Cost/Effectiveness of Improved Smog Check Program
With Loaded Mode Testing

Costs:

$57 ÷ 2 =	$28.50	(annual average inspection fee)
+ 6 ÷ 2 =	3.00	(annual avg. cost for Smog Certificate)
+ ($100 × 0.50) ÷ 2 =	25.00	(annual avg. repair cost per vehicle)
	$56.50	(total annual cost per vehicle)
÷	2	(50% of costs assigned to HC + NOx)
	$28.25	(annual cost for HC + NOx control)
	$28.25	(annual cost for CO control)

Emission Reductions:

2.11 g/mi HC × 48.6% =	1.03 g/mi	(HC reduction)
1.55 g/mi NOx × 20.3% =	0.31 g/mi	(NOx reduction)
	1.34 g/mi	(HC + NOx reduction)
×	10,000 miles/year	(annual vehicle mileage)
	29.52 pounds of HC + NOx	(annual reduction)

23.71 g/mi CO × 48.6% =	11.52 g/mi	(CO reduction)
×	10,000 miles/year	(annual vehicle mileage)
	253.74 pounds of CO	(annual reduction)

Cost/Effectiveness:

HC + NOx Cost/Effectiveness Ratio = $28.25 ÷ 29.52 lbs. = $0.96/pound

CO Cost/Effectiveness Ratio = $28.25 ÷ 253.74 lbs. = $0.11/pound

Notes: Cost for inspections is estimated to increase to approximately $57 due to the cost of loaded mode testing equipment and longer testing time.

Average repair cost for improved I/M programs is expected to stay at about $100 but the failure rate is estimated to increase to about 50%.

passing the test, but identification is only the first step. If diagnosis and repair cannot be accomplished at the Smog Check station that first fails the vehicle, then the vehicle will have to be taken to another facility for diagnosis. Even if the loaded mode test is not repeated, this would increase the cost and inconvenience of the program.

Another concern with the loaded mode analysis is that it is based on the assumption that a $50,000 capital investment at each Smog Check station is politically feasible. Although the cost/effectiveness of loaded mode testing is well within the range of other air pollution control programs, many of the 8,000 private facilities currently participating in the Smog Check program are likely to drop out if such an investment is required. This would be especially true for those garages that do inspections as more of a sideline than a central part of their business. The elimination of low-volume stations would improve the overall cost/effectiveness of the program, but there may be substantial opposition to new program requirements that would eliminate a large number of stations from the testing business.

Alternative Approaches

There are two alternatives to the basic loaded mode testing concept that have been evaluated thus far. First, less expensive loaded mode testing may be possible if current BAR efforts to develop an improved steady-state loaded mode test are successful. If ongoing research indicates that transient testing can be avoided without giving up much correlation with the FTP, then the cost of loaded mode testing will be reduced by more than 50%.

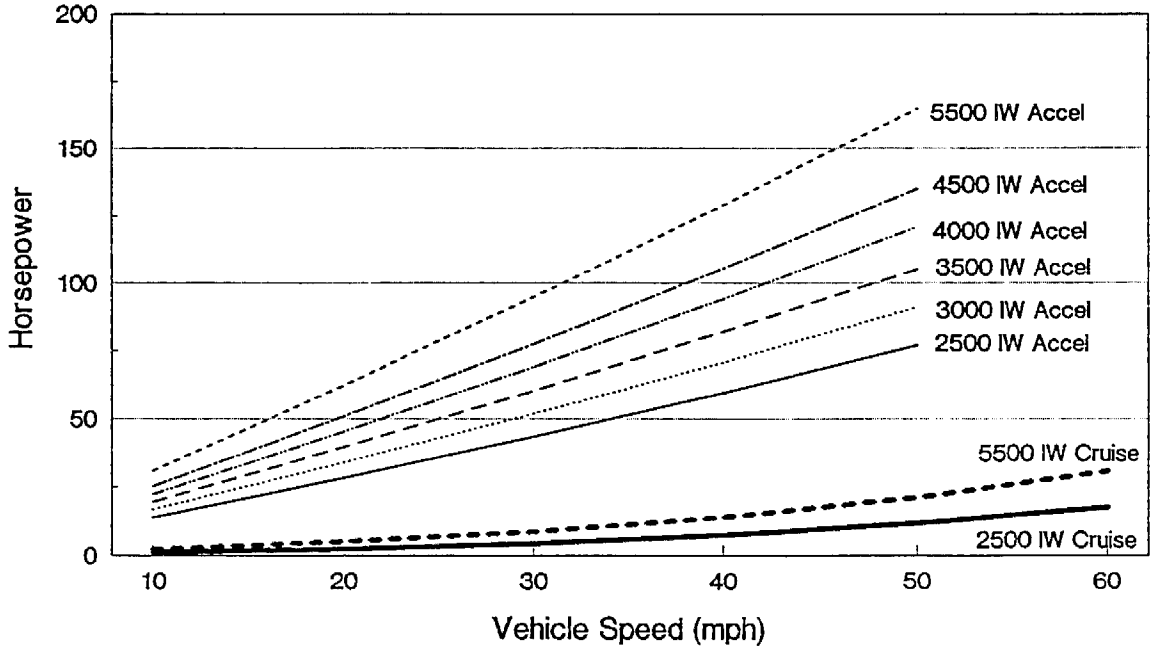
Alternatively, it may be possible to identify defective vehicles much more effectively with improved Test Analyzer Systems and improved onboard diagnostic (OBD) systems for motor vehicles.

Further analysis of these alternatives will enable the Bureau of Automotive Repair and local air pollution control districts to determine the optimum course for the Smog Check program in the future.

Current Efforts to Reduce the Cost of Loaded Mode Testing - Figure 4 illustrates why the concept of using elevated testing loads is important. The figure shows calculated rear wheel horsepower requirements for a range of vehicle inertia weights. The two lower curves are for "steady-state" cruise modes. The other family of curves shows the rear wheel power demand at the maximum acceleration rate that occurs on the Federal Test Procedure (3.3 mph/sec). The computer analysis of the FTP shows that the peak power demand occurs at 33.5 mph during one of the hardest accelerations. Based on Figure 4, about 100 horsepower is required at that condition. When testing a vehicle using the FTP, only a small fraction of the total power required is absorbed by the dynamometer. Most of the power is required to accelerate the flywheels that simulate the vehicle's weight.

Figure 4

Rear Wheel Horsepower Requirements
Acceleration vs. Cruise



Note: Load under acceleration calculated for maximum acceleration rate on Federal Test Procedure (3.3 mph/sec)

Because of the expense associated with dynamometers having inertia simulation, and because of the higher cost and complexity associated with exhaust gas measurement during transient vehicle operation, the use of steady-state testing is desirable in an I/M program. But to simulate an acceleration mode without actually using a transient test, i.e. by steady-state testing, the dynamometer must absorb all the power that is required to accelerate a vehicle. As Figure 4 showed, these power levels generally are above 50 hp.

Using the "Vehicle Simulation - Emissions" (VEHSIME) computer model, Sierra has attempted to identify which load-speed combinations are the greatest contributors to the total emissions that occur during the Federal Test Procedure. The load-speed range of the three different types of vehicles have been represented by a matrix in which each cell was 10 mph wide (e.g. 0-9 mph, 10-19 mph, etc.) and 10 horsepower high (e.g. 0-9 hp, 10-19 hp, etc.). As expected, the analysis showed that a relatively small fraction of total FTP emissions is generated at or near idle operation. For example, operation near idle accounted for about 20% of the HC emissions. However, NOx emissions generated at idle were negligible.

Our analysis showed that significant fractions of total emissions are generated under relatively high loads and speeds. For instance, with a 3500-pound vehicle simulation, 30% of the total CO emissions were seen to occur in the range of 30-39 mph with a load of 50-70 horsepower. Therefore, higher-power modes will be required for improved correlation between steady-state operation and the FTP, to identify the excess emitters that need to be repaired.

The computer-selected modes for an improved steady-state loaded mode test are illustrated in Figures 5, 6, and 7. For comparison purposes, the figures also include the "key modes" recommended by Clayton and the loaded mode test condition ("CalVIP") used in the centralized I/M program that ran in Los Angeles from 1979 to 1984. If the modes selected by our computer analysis (labeled "Sierra") prove to be superior, then improved correlation with the FTP will require significantly higher power absorption than occurs with the loaded mode tests that have been previously recommended.

Figure 5

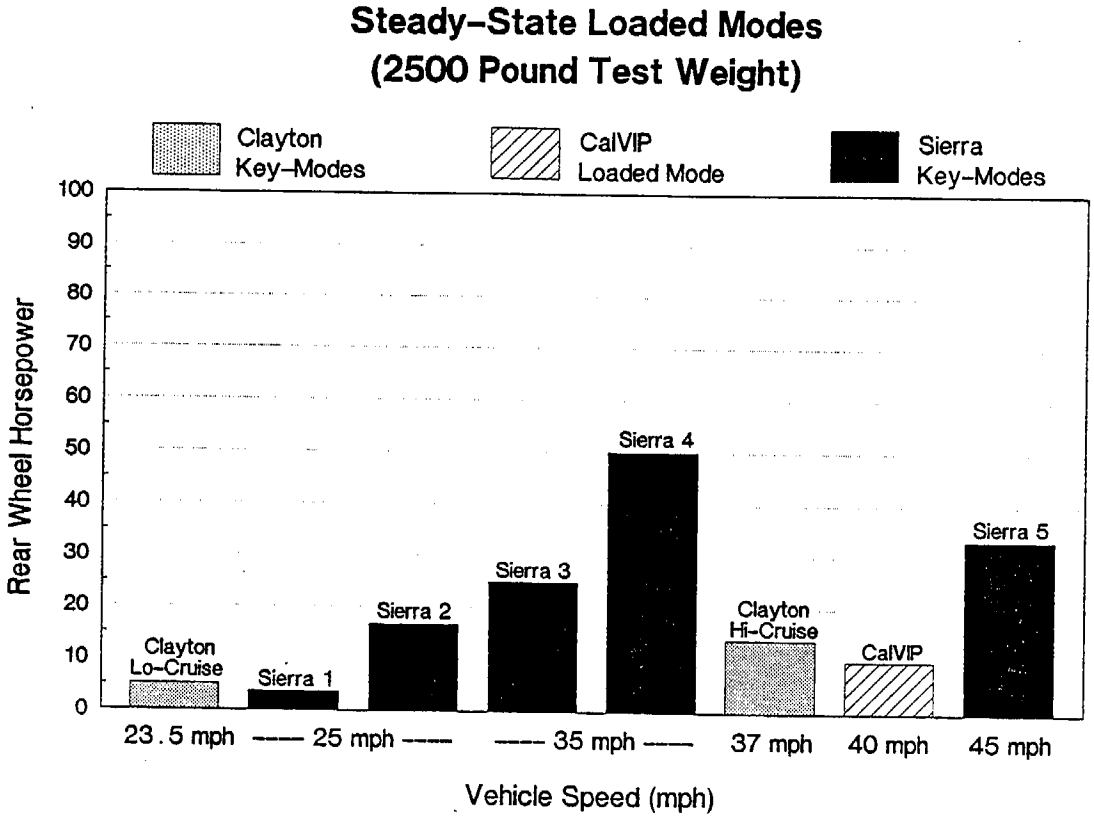


Figure 6

Steady-State Loaded Modes
(3500 Pound Test Weight)

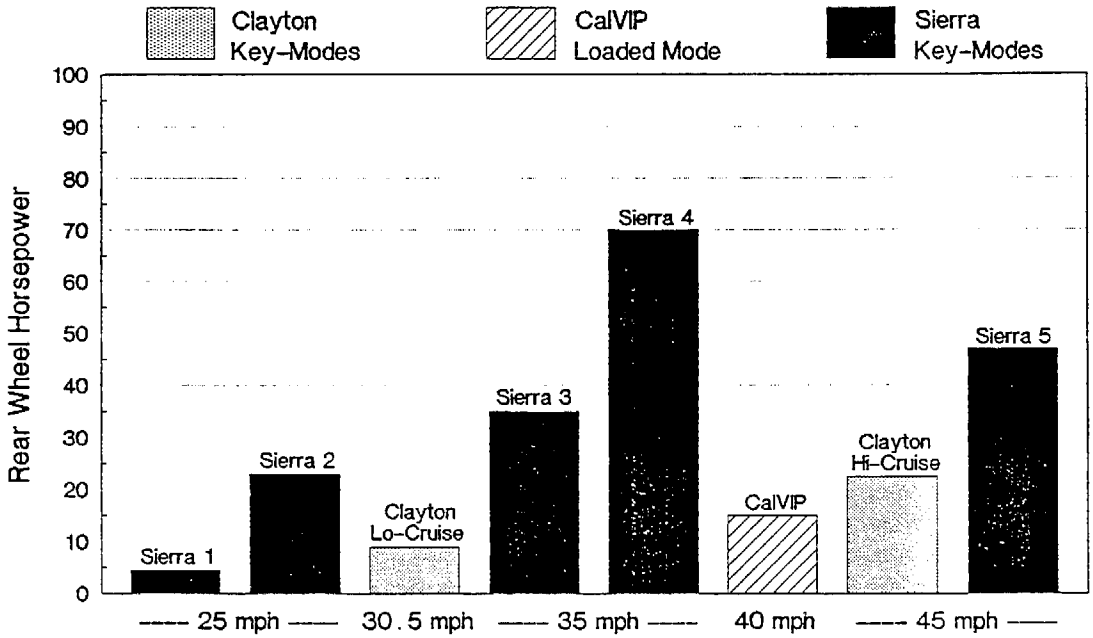


Figure 7

Steady-State Loaded Modes
(4500 Pound Test Weight)

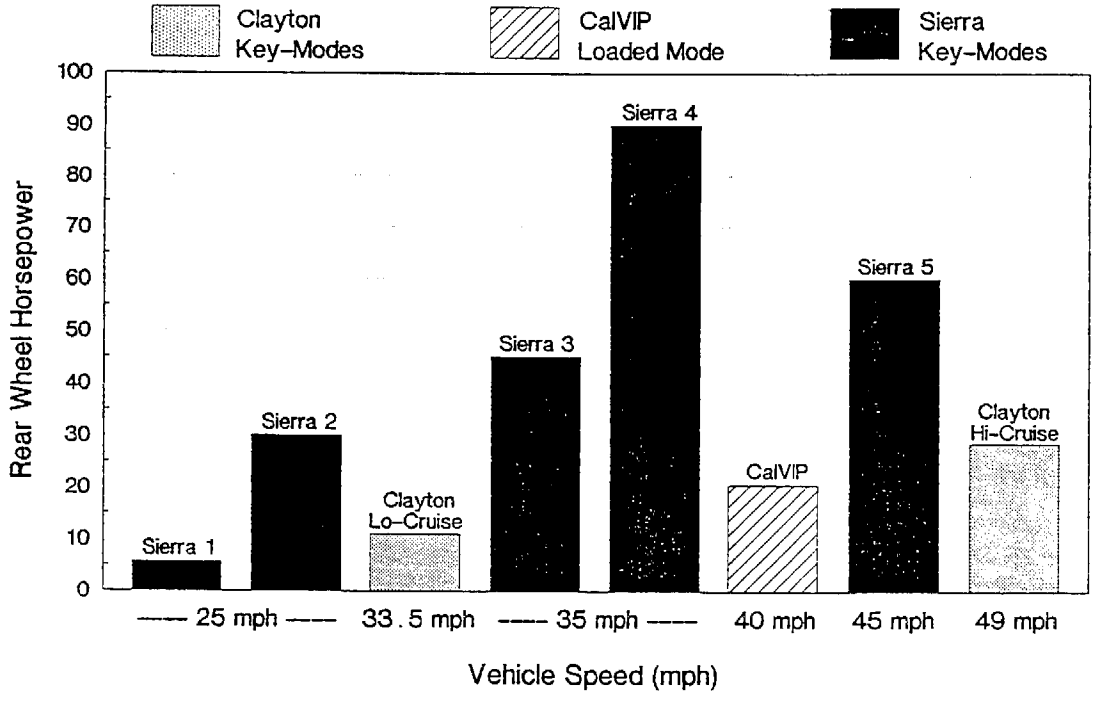


Table 10 contains a series of test modes that are currently being investigated by Sierra under a contract with BAR. As shown in the table, there are forty different test modes under evaluation. These modes include the modes selected by computer analysis as well as many other alternatives.

Table 10

Test Regimes for Loaded Mode Evaluation

Test Type	Test Modes	Speed (mph)	Load (horsepower)
FTP	cold start, 3 bags	varying	road load + inertia
No Load (in neutral)	Idle	0	0
	2500 rpm	0	0
CDH-226	hot start, 2 "hills"	varying	road load + inertia
Clayton Key Mode	Low Cruise		
	2000-2800 lbs	23.5	5
	2801-3800 lbs	30.5	9
	≥3801 lbs	33.5	11
	High Cruise		
	2000-2800 lbs	37	14
	2801-3800 lbs	45	22.5
	≥3801 lbs	49	28.5
CalVIP	40 MPH Cruise Mode		
	≤4 cylinders	40	10
	5-6 cylinders	40	15
	≥7 cyl., ≤3250 lbs	40	17.5
	≥7 cyl., >3250 lbs	40	20.5
Road Load		15	road load
		25	road load
		35	road load
		45	road load
		55	road load
Torque Converter Load	idle rpm in gear	0	undefined
	1500 rpm in gear	0	undefined
	2000 rpm in gear	0	undefined

--- continued on next page ---

Table 10 (continued)

Test Regimes for Loaded Mode Evaluation

Test Type	Test Modes	Speed (mph)	Load (horsepower)
Acceleration Simulation Modes	Max LA4 Accel	15	(a) IW ÷ 125
		25	(b) IW ÷ 75
		35	(c) IW ÷ 50
		45	(d) IW ÷ 37
		55	(e) IW ÷ 30
	125% LA4 Accel	15	125% of (a)
		25	125% of (b)
		35	125% of (c)
		45	125% of (d)
		55	125% of (e)
	75% LA4 Accel	15	75% of (a)
		25	75% of (b)
		35	75% of (c)
		45	75% of (d)
		55	75% of (e)
	50% LA4 Accel	15	50% of (a)
		25	50% of (b)
		35	50% of (c)
		45	50% of (d)
		55	50% of (e)
	25% LA4 Accel	15	25% of (a)
		25	25% of (b)
		35	25% of (c)
		45	25% of (d)
		55	25% of (e)

As illustrated in Table 10, the test program includes FTP's, plus several candidate loaded mode procedures. These include the Colorado Department of Health's CDH-226 (which requires a CVS), the Clayton Key-Mode, the CalVIP mode, and several steady-state tests at a range of rear-wheel loads bracketing the power demands that a vehicle will ever see in either FTP testing or real life. The "acceleration simulation modes" are defined in terms of the maximum acceleration rate that occurs on the FTP (3.3 mph/sec). On the FTP, this maximum rate occurs at speeds up to about 35 mph. The acceleration simulation modes are being run at steady-state by loading the vehicle to the same extent that would be required to sustain an acceleration. This is a

much higher load than the load required to sustain the same speeds under "cruise" (non-acceleration) conditions. Under the test program, we are running steady-state modes which simulate various fractions of the maximum FTP acceleration rate at a variety of speeds between 15 and 55 mph.

In order to investigate the potential for detecting high NOx emissions without the use of a dynamometer, several "torque converter load" modes are being investigated. One of the torque converter load modes just has the engine operating at idle. This could improve the correlation seen with the conventional idle test because many vehicles do not operate in "closed loop" condition until they are placed in gear. The other two torque converter load modes require the rpm of the engine to be increased while the brakes are applied to keep the vehicle from moving. Unlike with idle testing, the torque converter load modes will activate the EGR system and generate sufficient engine load to produce significant NOx emissions. For automatic-transmission-equipped vehicles, this mode could provide significantly improved correlation with the FTP.

Under a subcontract with Sierra, Southwest Research Institute is currently testing five popular passenger car models using all of the modes listed in Table 10 that can be run. (Some vehicles have inadequate power to run all modes.) The test vehicles include light weight (2250-2750 IW), relatively heavy (4000-4500 IW), and intermediate weight (3000-3500 IW) models. For each test mode, mass emission rate (grams per second or grams per mile) is being determined in addition to the raw exhaust gas concentration at the tailpipe. SwRI is inspecting each vehicle for the presence of emissions-related defects prior to the start of testing. The inspection includes:

1. physical integrity of the emission control system (off-idle vacuum to EGR, fuel filler neck lead restrictor ability to stop insertion of leaded nozzle, proper routing of all vacuum lines and wires, lack of obvious damage to catalyst, air pump connection and flow, PCV connection and free movement, evaporative canister connection, carburetor adjustment seals if visible);

2. fault codes on engines equipped with onboard diagnostic systems;

3. oxygen sensor function using the "finger touch" method or other method approved by Sierra (any defective oxygen sensors shall be saved for use during the "implanted defects" testing);

4. air cleaner restriction (visual); and

5. ignition system performance (any misfires on scope?).

Of course, each vehicle will also receive an inspection for safety-related defects and exhaust system integrity. SwRI may repair any such problems before testing if it proves to be less expensive to fix the vehicle than to reject it. Depending on what is most economical, SwRI will either reject or repair vehicles with missing, misfueled, or physically damaged catalysts. The results of the pre-test inspection will be thoroughly documented.

Each vehicle is then being tested in a baseline condition (with certain defects corrected). The test will be in a defective condition first if any of the following problems are found:

(1) oxygen sensor fails to respond to finger touch test;

(2) fault codes are displayed by onboard diagnostics;

(3) obvious intermittent misfire occurs; or

(4) warmed-up vehicle emits more than:

	idle	2500 rpm in neutral
HC (hexane)	100 ppm	220 ppm
CO	1.0%	1.2%

SwRI may also perform the baseline test on vehicles with obviously damaged, misfueled, or missing catalysts if it would be more economical to repair the defect than to reject the car and simulate catalyst failure through removal of a good catalyst.

SwRI has been instructed not to test vehicles in the defective condition first if it finds things like disconnected evaporative canister, disconnected PCV, disconnected TAC, plugged air cleaner, vacuum leak, or other minor problems that may not have a significant effect on exhaust emission levels. Vehicles with such defects will be repaired before baseline testing.

Following the baseline tests, vehicles tested in a defective condition will be repaired and retested using all forty modes. For vehicles that were not defective when baseline tested, defects will be implanted. The implanted defects to be evaluated after the baseline test will include:

1. EGR disconnection,
2. oxygen sensor disconnection,
3. air injection system disconnection,
4. spark plug misfire, and
5. catalyst removal.

After the completion of the testing, Sierra will determine which testing modes appear to be the most promising. Some modes will be deleted and others may be modified. Twenty additional vehicles to be tested under the second phase will receive the same initial inspections as were performed on the first five vehicles. The pattern of defect implantation to be used on the vehicles could be different from that used in the first phase.

Table 11 is our best estimate of the modes we expect to be running during the second phase of the testing. If the test results are consistent with our projections, we will be able to cut the total number of modes down to less than ten.

Table 11

Phase 2 Test Regimes for Loaded Mode Evaluation

Test Type	Test Modes	Speed (mph)	Load (horsepower)
FTP	cold start, 3 bags	varying	road load + inertia
No Load (in neutral)	Idle	0	0
	2500 rpm	0	0
Torque Converter Load	idle rpm in gear	0	undefined
	1500 or 2000 in gear	0	undefined
Anticipated Key Modes	low speed cruise	25	road load
	low speed light accel	25	IW ÷ 150
	medium speed light accel	35	IW ÷ 100
	medium speed med. accel	35	IW ÷ 50
	high speed medium accel	45	IW ÷ 75

Table 12 presents a rough estimate of what the cost-effectiveness of loaded mode testing would be if our efforts to develop a steady-state test with improved correlation are successful.

Table 12

Cost/Effectiveness of Improved Smog Check Program
With Optimized Steady-State Loaded Mode Testing

Costs:

$44 ÷ 2 =	$22.00	(annual average inspection fee)
+ 6 ÷ 2 =	3.00	(annual avg. cost for Smog Certificate)
+ ($100 × 0.50) ÷ 2 =	25.00	(annual avg. repair cost per vehicle)
	$50.00	(total annual cost per vehicle)
÷	2	(50% of costs assigned to HC + NOx)
	$25.00	(annual cost for HC + NOx control)
	$25.00	(annual cost for CO control)

Emission Reductions:

2.11 g/mi HC × 48.6% =	1.03 g/mi	(HC reduction)
1.55 g/mi NOx × 20.3% =	0.31 g/mi	(NOx reduction)
	1.34 g/mi	(HC + NOx reduction)
×	10,000 miles/year	(annual vehicle mileage)
	29.52 pounds of HC + NOx	(annual reduction)

23.71 g/mi CO × 48.6% =	11.52 g/mi	(CO reduction)
×	10,000 miles/year	(annual vehicle mileage)
	253.74 pounds of CO	(annual reduction)

Cost/Effectiveness:

HC + NOx Cost/Effectiveness Ratio = $25.00 ÷ 29.52 lbs. = $0.85/pound

CO Cost/Effectiveness Ratio = $25.00 ÷ 253.74 lbs. = $0.10/pound

Notes: Cost for inspections is estimated to increase to approximately $44 due to the cost of loaded mode testing equipment and longer testing time.

Average repair cost for improved I/M programs is expected to stay at about $100 but the failure rate is estimated to increase to about 50%.

The difference between the estimate shown in Table 12 and the earlier estimate is that the loaded mode equipment cost is assumed to be reduced by two-thirds due to the elimination of the need for constant volume samplers and inertia weights. The potential elimination of constant volume sampling is based on the assumption that it will be possible to estimate exhaust volume under steady-state conditions. By measuring engine speed and rear wheel horsepower, the volumetric flow rate of engine exhaust can be calculated for vehicles running a stoichiometric air/fuel ratio by estimating drivetrain efficiency and brake-specific fuel consumption. Under our contract with BAR, we are currently developing an algorithm to make this computation. The data being obtained under the SwRI testing program will be used to validate the algorithm.

Caveats

The analyses presented above are all based on the assumption that the $50 repair cost ceiling that currently applies to the Smog Check program will be increased substantially and that extended warranty coverage will be available for the most expensive emissions control system components. Without such increases in the resources available to repair defective vehicles, the theoretical benefits of improved testing regimes will not be realized in practice.

6. ADDITIONAL VEHICLE CATEGORIES

Figures 8, 9, and 10 show the relative HC, CO, and NOx emissions for all of the mobile source categories in the South Coast Air Basin emissions inventory. While light- and medium-duty on-road vehicles account for about three-fourths of all mobile source emissions, it is apparent that there are significant emissions occurring in other mobile source categories.

Of the on-road mobile sources, only heavy-duty gasoline vehicles, heavy-duty Diesel vehicles, and motorcycles are currently excluded from the I/M program. Incorporation of heavy-duty vehicles has recently been addressed in separate reports to ARB and is not considered here. Motorcycles and "other" mobile sources are addressed below.

Motorcycles

The addition of motorcycles to the Smog Check program appears to have only limited potential currently. Under the current emission standards that apply to motorcycles, there are few emission control devices to tamper with. In addition, misfire is so obvious in a motorcycle that fewer ignition system defects would be anticipated. There could be significant CO reductions associated with "low emissions" adjustment of carburetors, but riders tend to be more mechanically inclined and readjustment for improved driveability would be likely. However, the addition of motorcycles to the Smog Check program may be cost-effective when and if emission standards ever require catalysts. In this event, Smog Check would be a significant deterrent to tampering.

Other Mobile Sources

"Other" mobile sources listed in the inventory include:

1. off-road vehicles,
2. trains,
3. ships,
4. aircraft,
5. mobile equipment, and
6. utility equipment.

Off-Road Vehicles - All vehicles in this category are difficult to deal with because they are not licensed for street use and so there is no practical way to inspect them at fixed sites. Random

Figure 8

Mobile Source ROG Emissions in the South Coast Air Basin (1985 Estimates)

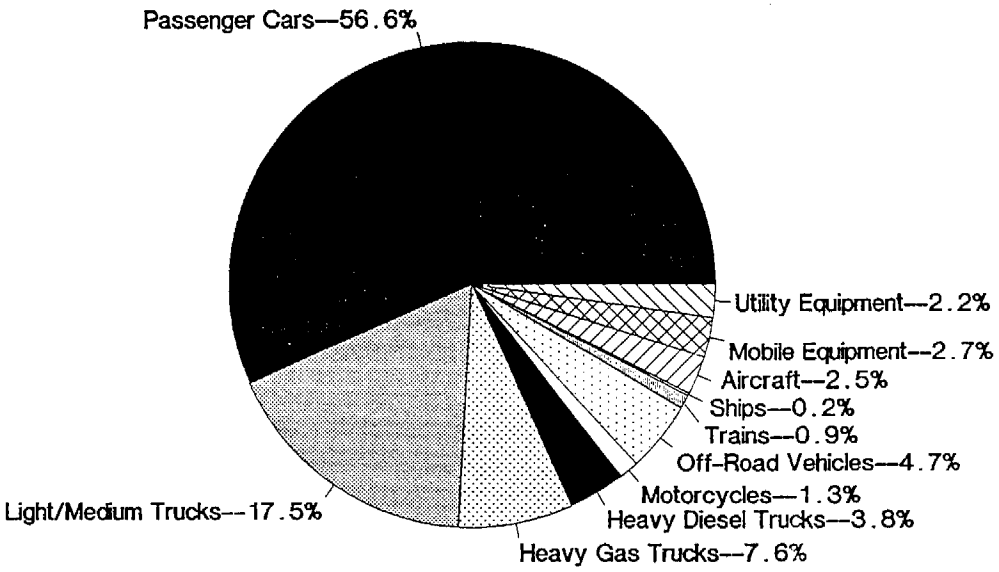


Figure 9

Mobile Source CO Emissions in the South Coast Air Basin (1985 Estimates)

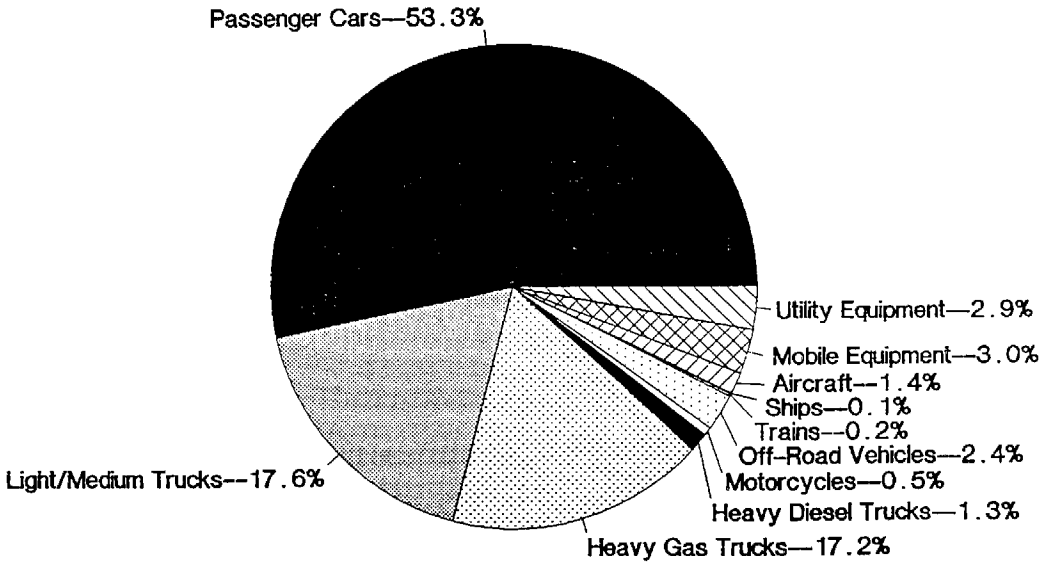
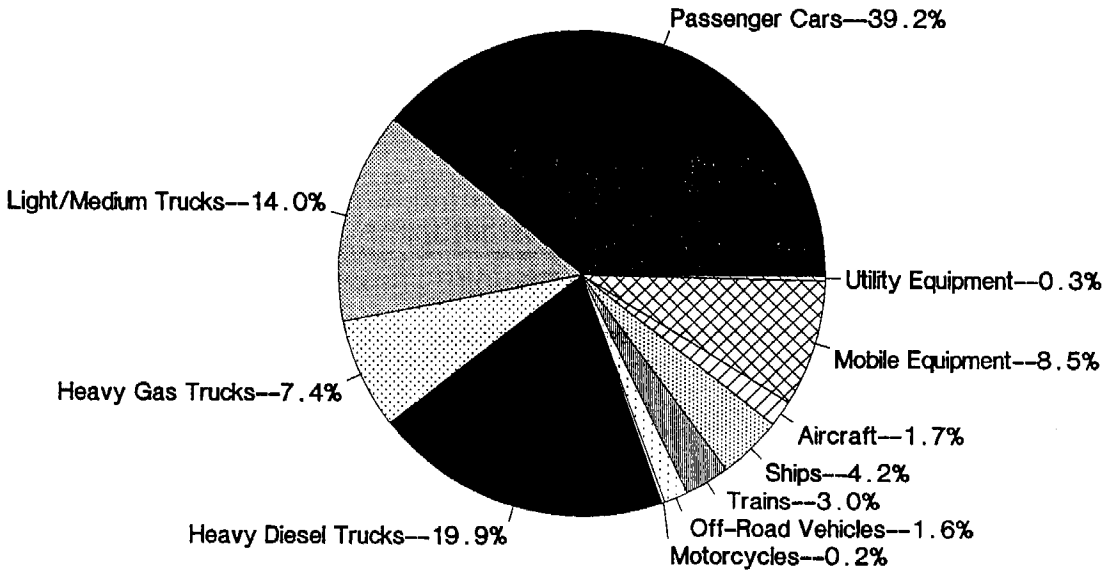


Figure 10

Mobile Source NOx Emissions in the South Coast Air Basin (1985 Estimates)



inspections at locations where the equipment is used would appear to be the only practical means of implementing some sort of I/M program. Because of the relatively low concentration of off-road vehicles at any particular site, this approach does not appear to be economically attractive. However, there are other problems as well. There is no significant emissions reduction potential for off-road motorcycles and ATVs since relatively few emissions occur within non-attainment areas and there are no emission controls to tamper with. As in the case of on-road motorcycles, maintenance-related problems are less likely and carburetor readjustment is likely to occur if standards require "low emissions" adjustment. Off-road construction equipment could be worth including when and if emission controls are ever required.

Aircraft - Lack of maintenance is clearly not a problem expected with aircraft. High emission modes of operation are related to basic engine designs. In the case of piston-engine, private craft, it has been well-documented that these sources are gross carbon monoxide emitters due to the extreme mixture enrichment used during take-off operations. Any attempt to require "low emission adjustments" would raise serious safety concerns.

Commercial jet aircraft are known to experience high hydrocarbon emissions during light-load ground operations. This high emission mode is associated with the basic design of the combustors that are designed for peak efficiency during high load operation. Although there is significant potential for reducing jet engine emissions through combustor redesign, there is no known maintenance technique that would reduce emissions from existing engines.

Trains - As with other categories of "other mobile sources", train engine emissions are higher than they could be due to basic engine design. Almost all trains use open-chamber Diesel engines with no emission controls. Emission rates are very similar to uncontrolled heavy-duty truck engines (e.g., 16 grams/bhp-hr NOx emissions). The same emission control technology that has been used to reduce on-road Diesel truck emissions can be employed, but the potential for reducing emissions from existing trains through improved maintenance is limited. However, there is some potential for reducing train engine emissions through the use of "low emission adjustment".

Significant NOx emission reductions could be achieved through the use of injection retard. The practical problem associated with mandatory low emission adjustment is that fuel economy will be adversely affected. But there are no safety issues to deal with as in the case of low emission adjustments for aircraft, and the emission reductions may prove to be cost-effective. This possibility needs further study. ARB might consider a testing program under which the effect of timing retard on several popular locomotive engines is investigated.

Ships - The interstate and international aspects of ship emissions, combined with the lack of any obvious maintenance-related problems, should eliminate this category from consideration.

Mobile and Utility Equipment - As with trains, Diesel-powered equipment in these categories would realize reduced emissions through mandatory "low emissions adjustments". However, the increased variety of engines makes these categories less suited for control.

In summary, there is no evidence that lack of proper maintenance contributes to any significant extent to excess emissions in any of the "other mobile" categories. The greatest potential for reducing emissions from existing sources appears to be associated with a "low emissions adjustment" requirement for trains.

Appendix A

Technology Specific TAS Data Summaries

Record Counts

Test Records Processed:	89830
Initial Test Records:	89830
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	58179
Initial Test Vehicles:	58179
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	71.9	28.1	--	--	2.9	26.7	1.5	25.2	1.4	6.2	10.6
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.35	78	836	0.58	61	2501
Initial Test - Pass Vehicles	0.04	29	834	0.16	30	2501
Initial Test - Fail Vehicles	1.13	202	838	1.65	139	2499
Initial Test - Underhood Fail Only	0.05	33	837	0.18	31	2502
Initial Test - Tailpipe Fail Only	1.16	206	839	1.70	142	2499
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.7
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.1	0.5	0.2	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	1.3
Pass	99.7	92.7	82.7	99.8	99.8	16.0	84.0	97.6	96.4	74.9	97.2	65.8	100.0
N/A	0.2	6.8	17.1	0.1	0.1	84.0	16.0	2.2	3.6	25.1	2.7	34.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	79.0	57.2	56.1	89.7
Fail	0.6	0.4	1.2	2.1
N/A	20.4	21.3	21.6	37.8

Record Counts

Test Records Processed:	80961
Initial Test Records:	80961
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	57875
Initial Test Vehicles:	57875
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	72.0	28.0	--	--	2.9	26.6	1.4	25.2	1.4	6.2	10.2
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.36	78	832	0.58	61	2500
Initial Test - Pass Vehicles	0.04	29	830	0.15	30	2500
Initial Test - Fail Vehicles	1.16	203	834	1.68	140	2499
Initial Test - Underhood Fail Only	0.05	33	831	0.18	31	2503
Initial Test - Tailpipe Fail Only	1.18	206	835	1.74	143	2498
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.8
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.1	0.5	0.3	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	1.3
Pass	99.8	94.3	89.7	99.8	99.8	14.0	85.9	97.4	96.3	76.1	97.2	65.7	100.0
N/A	0.2	5.2	10.0	0.1	0.1	86.0	14.0	2.5	3.7	23.9	2.8	34.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	79.5	57.1	55.8	89.8
Fail	0.4	0.4	1.3	2.0
N/A	20.0	21.5	21.9	37.8

Record Counts

Test Records Processed:	80545
Initial Test Records:	80545
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	57857
Initial Test Vehicles:	57857
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	72.0	28.0	--	--	2.9	26.5	1.4	25.1	1.4	6.2	10.1
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.36	78	832	0.59	61	2500
Initial Test - Pass Vehicles	0.04	29	830	0.16	30	2500
Initial Test - Fail Vehicles	1.17	203	834	1.70	140	2499
Initial Test - Underhood Fail Only	0.05	33	831	0.18	31	2503
Initial Test - Tailpipe Fail Only	1.19	206	835	1.75	143	2498
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.3	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.8
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Totl	0.1	0.5	0.3	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	1.3
Pass	99.8	94.4	89.7	99.8	99.8	14.1	85.9	97.9	96.3	76.5	97.2	65.7	100.0
N/A	0.2	5.1	10.1	0.1	0.1	85.9	14.1	1.9	3.6	23.5	2.8	34.2	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	79.6	57.1	56.1	89.9
Fail	0.4	0.4	1.3	2.0
N/A	20.0	21.5	21.6	37.5

VEHICLES WITH CARB/AIR/NO EGR
CALIFORNIA I/M SUMMARY STATISTICS

25-APR-1988

Record Counts

Test Records Processed:	416
Initial Test Records:	416
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	61494
Initial Test Vehicles:	61494
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	60.1	39.9	--	--	3.4	38.9	1.0	36.5	2.4	0.7	34.9
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.09	120	817	0.11	84	2492
Initial Test - Pass Vehicles	0.01	43	814	0.03	47	2490
Initial Test - Fail Vehicles	0.21	235	821	0.22	140	2495
Initial Test - Underhood Fail Only	0.00	62	788	0.01	53	2523
Initial Test - Tailpipe Fail Only	0.23	243	821	0.24	145	2494
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.2	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.4
Mod	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.2	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.2	3.4
Pass	99.5	81.7	100.0	99.8	96.6	0.0	100.0	0.0	82.5	0.0	97.8	62.7	100.0
N/A	0.2	18.3	0.0	0.2	0.5	100.0	0.0	100.0	17.5	100.0	2.2	37.0	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	67.8	45.7	0.2	81.5
Fail	0.0	0.0	0.0	0.0
N/A	32.2	23.3	68.8	81.3

Record Counts

Test Records Processed:	8869
Initial Test Records:	8869
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	60950
Initial Test Vehicles:	60950
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	70.8	29.2	--	--	3.3	27.3	1.9	25.9	1.4	5.5	14.6
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.31	77	870	0.51	58	2507
Initial Test - Pass Vehicles	0.06	30	871	0.16	29	2507
Initial Test - Fail Vehicles	0.91	192	868	1.35	127	2506
Initial Test - Underhood Fail Only	0.06	31	877	0.13	28	2495
Initial Test - Tailpipe Fail Only	0.97	201	868	1.43	133	2507
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.2	0.0	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.6
Pass	99.7	78.0	18.2	99.8	99.8	33.7	66.3	99.9	97.5	64.4	97.9	66.5	100.0
N/A	0.3	21.8	81.7	0.1	0.1	66.3	33.7	0.0	2.4	35.6	2.1	33.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	74.5	58.6	58.8	88.8
Fail	1.7	0.6	0.8	2.9
N/A	23.9	19.2	18.9	38.1

Record Counts

Test Records Processed:	8869
Initial Test Records:	8869
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	60950
Initial Test Vehicles:	60950
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	70.8	29.2	--	--	3.3	27.3	1.9	25.9	1.4	5.5	14.6
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.31	77	870	0.51	58	2507
Initial Test - Pass Vehicles	0.06	30	871	0.16	29	2507
Initial Test - Fail Vehicles	0.91	192	868	1.35	127	2506
Initial Test - Underhood Fail Only	0.06	31	877	0.13	28	2495
Initial Test - Tailpipe Fail Only	0.97	201	868	1.43	133	2507
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.2	0.0	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.6
Pass	99.7	78.0	18.2	99.8	99.8	33.7	66.3	99.9	97.5	64.4	97.9	66.5	100.0
N/A	0.3	21.8	81.7	0.1	0.1	66.3	33.7	0.0	2.4	35.6	2.1	33.4	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	74.5	58.6	58.8	88.8
Fail	1.7	0.6	0.8	2.9
N/A	23.9	19.2	18.9	38.1

VEHICLES WITH MPFI
CALIFORNIA I/M SUMMARY STATISTICS

25-APR-1988

Record Counts

Test Records Processed:	12597
Initial Test Records:	12597
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	54435
Initial Test Vehicles:	54435
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	80.3	19.7	--	--	2.0	18.4	1.3	17.6	0.7	1.4	10.6
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	60	832	0.38	40	2494
Initial Test - Pass Vehicles	0.06	27	834	0.13	20	2495
Initial Test - Fail Vehicles	1.48	191	824	1.40	124	2493
Initial Test - Underhood Fail Only	0.07	33	840	0.15	24	2482
Initial Test - Tailpipe Fail Only	1.58	200	823	1.48	131	2493
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.5
Pass	99.4	33.4	3.3	99.6	99.7	0.1	99.9	57.2	88.4	99.8	99.5	64.8	100.0
N/A	0.6	66.5	96.7	0.2	0.2	99.9	0.1	42.8	11.6	0.1	0.5	35.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	88.6	59.0	35.8	93.9
Fail	0.9	0.4	0.4	1.7
N/A	10.5	20.2	43.3	49.8

VEHICLES WITH MPFI/AIR
CALIFORNIA I/M SUMMARY STATISTICS

25-APR-1988

Record Counts

Test Records Processed:	411
Initial Test Records:	411
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	52540
Initial Test Vehicles:	52540
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.6	22.4	--	--	1.5	21.4	1.0	20.9	0.5	2.9	5.8
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.47	65	735	0.44	37	2475
Initial Test - Pass Vehicles	0.05	21	724	0.08	16	2472
Initial Test - Fail Vehicles	1.94	218	774	1.72	111	2487
Initial Test - Underhood Fail Only	0.05	22	693	0.13	17	2447
Initial Test - Tailpipe Fail Only	1.97	224	778	1.78	117	2489
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Totl	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Pass	96.4	37.0	100.0	99.5	98.8	2.4	97.6	7.8	94.2	96.6	99.8	65.7	100.0
N/A	3.6	63.0	0.0	0.5	0.5	97.6	2.4	92.2	5.8	3.4	0.2	34.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	87.8	70.6	6.3	93.7
Fail	0.2	0.2	0.2	0.7
N/A	11.9	17.3	81.5	83.5

VEHICLES WITH MPFI/AIR/EGR
CALIFORNIA I/M SUMMARY STATISTICS

25-APR-1988

Record Counts

Test Records Processed:	32
Initial Test Records:	32
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	62503
Initial Test Vehicles:	62503
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	84.4	15.6	--	--	3.1	12.5	3.1	12.5	0.0	0.0	3.1
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.32	120	733	0.61	40	2489
Initial Test - Pass Vehicles	0.02	19	716	0.07	13	2499
Initial Test - Fail Vehicles	1.92	668	824	3.49	187	2432
Initial Test - Underhood Fail Only	0.02	24	720	0.46	27	2430
Initial Test - Tailpipe Fail Only	2.40	829	851	4.25	227	2433
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pass	100.0	59.4	100.0	100.0	100.0	31.3	68.8	100.0	78.1	56.3	100.0	81.3	100.0
N/A	0.0	40.6	0.0	0.0	0.0	68.8	31.3	0.0	21.9	43.8	0.0	18.8	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	62.5	68.8	65.6	78.1
Fail	0.0	0.0	3.1	3.1
N/A	37.5	21.9	21.9	43.8

VEHICLES WITH MPFI/AIR/NO EGR
CALIFORNIA I/M SUMMARY STATISTICS

25-APR-1988

Record Counts

Test Records Processed:	379
Initial Test Records:	379
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	51699
Initial Test Vehicles:	51699
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.0	23.0	--	--	1.3	22.2	0.8	21.6	0.5	3.2	6.1
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.49	61	735	0.43	37	2474
Initial Test - Pass Vehicles	0.05	21	725	0.08	16	2469
Initial Test - Fail Vehicles	1.94	192	771	1.62	107	2490
Initial Test - Underhood Fail Only	0.06	21	683	0.02	14	2452
Initial Test - Tailpipe Fail Only	1.94	194	775	1.66	112	2492
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CPI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
Miss	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Totl	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
Pass	96.0	35.1	100.0	99.5	98.7	0.0	100.0	0.0	95.5	100.0	99.7	64.4	100.0
N/A	4.0	64.9	0.0	0.5	0.5	100.0	0.0	100.0	4.5	0.0	0.3	35.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	90.0	70.7	1.3	95.0
Fail	0.3	0.3	0.0	0.5
N/A	9.8	16.9	86.5	86.8

VEHICLES WITH MPFI/NO AIR
CALIFORNIA I/M SUMMARY STATISTICS

25-APR-1988

Record Counts

Test Records Processed:	12186
Initial Test Records:	12186
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	54499
Initial Test Vehicles:	54499
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	80.4	19.6	--	--	2.1	18.3	1.3	17.5	0.7	1.4	10.7
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.34	59	835	0.37	41	2495
Initial Test - Pass Vehicles	0.06	27	837	0.13	20	2495
Initial Test - Fail Vehicles	1.47	190	826	1.39	124	2493
Initial Test - Underhood Fail Only	0.07	33	844	0.15	24	2483
Initial Test - Tailpipe Fail Only	1.56	199	825	1.46	131	2493
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.5
Pass	99.5	33.3	0.0	99.6	99.7	0.0	100.0	58.8	88.2	100.0	99.5	64.8	100.0
N/A	0.5	66.6	100.0	0.2	0.2	100.0	0.0	41.1	11.8	0.0	0.5	35.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	88.6	58.6	36.8	93.9
Fail	1.0	0.4	0.5	1.7
N/A	10.4	20.3	42.0	48.7

Record Counts

Test Records Processed:	7179
Initial Test Records:	7179
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	53868
Initial Test Vehicles:	53868
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	79.0	21.0	--	--	2.2	19.7	1.4	18.8	0.9	1.3	12.4
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.31	65	821	0.37	44	2503
Initial Test - Pass Vehicles	0.04	29	822	0.11	21	2505
Initial Test - Fail Vehicles	1.31	201	816	1.37	130	2498
Initial Test - Underhood Fail Only	0.06	36	833	0.14	28	2490
Initial Test - Tailpipe Fail Only	1.39	209	815	1.42	137	2498
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Pass	99.6	27.2	0.0	99.8	99.8	0.0	100.0	99.9	90.2	100.0	99.6	66.1	100.0
N/A	0.4	72.8	100.0	0.1	0.2	100.0	0.0	0.0	9.8	0.0	0.4	33.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	88.9	61.8	62.3	94.6
Fail	1.0	0.5	0.8	2.1
N/A	10.1	18.1	17.4	26.0

Record Counts

Test Records Processed:	5007
Initial Test Records:	5007
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	55404
Initial Test Vehicles:	55404
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	82.5	17.5	--	--	1.8	16.3	1.3	15.7	0.5	1.5	8.3
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.37	51	855	0.38	36	2483
Initial Test - Pass Vehicles	0.08	25	858	0.15	19	2482
Initial Test - Fail Vehicles	1.74	172	844	1.43	114	2484
Initial Test - Underhood Fail Only	0.10	29	860	0.15	18	2472
Initial Test - Tailpipe Fail Only	1.86	183	843	1.54	121	2485
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Miss	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
Totl	0.0	0.2	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.8
Pass	99.3	42.0	0.0	99.4	99.6	0.0	100.0	0.0	85.3	99.9	99.4	63.0	100.0
N/A	0.7	57.8	100.0	0.4	0.1	100.0	0.0	100.0	14.7	0.0	0.6	36.9	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	88.2	54.1	0.4	92.8
Fail	0.9	0.2	0.0	1.1
N/A	10.9	23.4	77.3	81.2

Record Counts

Test Records Processed:	6170
Initial Test Records:	6170
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	51769
Initial Test Vehicles:	51769
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	77.8	22.2	--	--	1.6	21.3	0.9	20.6	0.7	0.7	17.4
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
					'Waivers' Only						

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.19	72	809	0.19	48	2503
Initial Test - Pass Vehicles	0.05	33	806	0.09	28	2504
Initial Test - Fail Vehicles	0.69	212	817	0.54	120	2498
Initial Test - Underhood Fail Only	0.04	35	797	0.11	23	2511
Initial Test - Tailpipe Fail Only	0.68	219	819	0.54	122	2497
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Totl	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.5
Pass	99.9	95.7	68.9	99.8	99.9	0.1	99.9	99.4	97.2	99.9	98.9	62.4	100.0
N/A	0.1	4.1	31.0	0.1	0.1	99.9	0.1	0.5	2.7	0.1	1.1	37.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	95.4	58.9	59.4	97.2
Fail	0.3	0.1	0.7	1.1
N/A	4.3	21.8	20.6	24.7

Record Counts

Test Records Processed:	4206
Initial Test Records:	4206
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	50446
Initial Test Vehicles:	50446
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	82.0	18.0	--	--	1.3	17.4	0.7	16.7	0.6	0.7	13.9
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle CO (%)	Idle HC (ppm)	Idle RPM	2500 CO (%)	2500 HC (ppm)	2500 RPM
Initial Test - All Vehicles	0.16	61	769	0.17	48	2491
Initial Test - Pass Vehicles	0.04	33	773	0.08	30	2493
Initial Test - Fail Vehicles	0.71	186	749	0.57	129	2486
Initial Test - Underhood Fail Only	0.02	43	748	0.10	29	2495
Initial Test - Tailpipe Fail Only	0.69	190	749	0.57	132	2484
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
IMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.5
Pass	99.9	98.0	99.9	99.9	99.9	0.1	99.9	99.9	97.6	99.8	99.0	61.9	100.0
N/A	0.0	1.9	0.0	0.0	0.1	99.9	0.1	0.0	2.3	0.1	1.0	38.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	95.0	61.7	62.6	96.9
Fail	0.3	0.1	0.5	1.0
N/A	4.7	20.9	19.6	23.8

VEHICLES WITH TBI/AIR/EGR
CALIFORNIA I/M SUMMARY STATISTICS

25-APR-1988

Record Counts

Test Records Processed:	4206
Initial Test Records:	4206
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	50446
Initial Test Vehicles:	50446
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	82.0	18.0	--	--	1.3	17.4	0.7	16.7	0.6	0.7	13.9
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.16	61	769	0.17	48	2491
Initial Test - Pass Vehicles	0.04	33	773	0.08	30	2493
Initial Test - Fail Vehicles	0.71	186	749	0.57	129	2486
Initial Test - Underhood Fail Only	0.02	43	748	0.10	29	2495
Initial Test - Tailpipe Fail Only	0.69	190	749	0.57	132	2484
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.5
Pass	99.9	98.0	99.9	99.9	99.9	0.1	99.9	99.9	97.6	99.8	99.0	61.9	100.0
N/A	0.0	1.9	0.0	0.0	0.1	99.9	0.1	0.0	2.3	0.1	1.0	38.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	95.0	61.7	62.6	96.9
Fail	0.3	0.1	0.5	1.0
N/A	4.7	20.9	19.6	23.8

VEHICLES WITH TBI/NO AIR
CALIFORNIA I/M SUMMARY STATISTICS

25-APR-1988

Record Counts

Test Records Processed:	1964
Initial Test Records:	1964
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	54600
Initial Test Vehicles:	54600
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	69.0	31.0	--	--	2.1	29.8	1.2	28.9	0.9	0.6	24.8
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.27	98	894	0.24	49	2527
Initial Test - Pass Vehicles	0.10	32	890	0.12	23	2534
Initial Test - Fail Vehicles	0.66	244	902	0.51	108	2513
Initial Test - Underhood Fail Only	0.07	26	857	0.12	17	2531
Initial Test - Tailpipe Fail Only	0.67	254	906	0.50	109	2512
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.5
Mod	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Totl	0.1	0.4	0.1	0.2	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.9
Pass	99.8	90.8	2.4	99.4	99.9	0.0	100.0	98.2	96.4	99.9	98.7	63.4	100.0
N/A	0.2	8.8	97.5	0.4	0.1	100.0	0.0	1.6	3.6	0.0	1.3	36.6	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.3	52.9	52.5	97.7
Fail	0.3	0.1	1.2	1.5
N/A	3.4	23.5	22.8	26.6

Record Counts

Test Records Processed:	1942
Initial Test Records:	1942
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	54746
Initial Test Vehicles:	54746
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	69.1	30.9	--	--	2.1	29.7	1.2	28.8	0.9	0.6	24.6
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM CO (%)	Idle RPM HC (ppm)	Idle RPM RPM	2500 RPM CO (%)	2500 RPM HC (ppm)	2500 RPM RPM
Initial Test - All Vehicles	0.27	98	894	0.24	49	2528
Initial Test - Pass Vehicles	0.10	32	890	0.12	23	2534
Initial Test - Fail Vehicles	0.67	246	902	0.51	109	2514
Initial Test - Underhood Fail Only	0.07	26	857	0.12	17	2531
Initial Test - Tailpipe Fail Only	0.68	256	906	0.50	110	2513
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
TMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.5
Mod	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Miss	0.0	0.2	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.3
Totl	0.1	0.4	0.1	0.2	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.9
Pass	99.8	91.5	2.5	99.4	99.9	0.0	100.0	99.3	96.4	99.9	98.7	63.7	100.0
N/A	0.1	8.1	97.5	0.4	0.1	100.0	0.0	0.5	3.6	0.0	1.3	36.3	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	96.2	52.7	53.1	97.6
Fail	0.3	0.1	1.2	1.5
N/A	3.5	23.4	21.9	25.7

Record Counts

Test Records Processed:	22
Initial Test Records:	22
After Repair Test Records:	0
Referee Test Records:	0

Average Odometer Readings

All Vehicles:	41705
Initial Test Vehicles:	41705
After Repair Test Vehicles:	--
Referee Test Vehicles:	--

Pass/Fail Percentages

	Passing	Failing	Incomplete Repair	Waived	Failing Underhood	Failing Tailpipe	Failing Underhood Only	Failing Tailpipe Only	Failing Tailpipe and Underhood	Failing CO Only	Failing HC Only
Initial Test	59.1	40.9	--	--	0.0	40.9	0.0	40.9	0.0	0.0	40.9
After Repair	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0

'Waivers' Only

Average Emission/RPM Levels

	Idle RPM			2500 RPM		
	CO (%)	HC (ppm)	RPM	CO (%)	HC (ppm)	RPM
Initial Test - All Vehicles	0.24	79	907	0.33	30	2505
Initial Test - Pass Vehicles	0.06	36	901	0.17	25	2539
Initial Test - Fail Vehicles	0.49	142	916	0.55	36	2455
Initial Test - Underhood Fail Only	--	--	--	--	--	--
Initial Test - Tailpipe Fail Only	0.49	142	916	0.55	36	2455
After Repair Test - All Vehicles	--	--	--	--	--	--
After Repair Test - Pass Vehicles	--	--	--	--	--	--
After Repair Test - Fail Vehicles	--	--	--	--	--	--
After Repair Test - Inc. Repr. Vehicles	--	--	--	--	--	--
After Repair Test - Waived Vehicles	--	--	--	--	--	--
After Repair Test - Underhood Fail Only	--	--	--	--	--	--
After Repair Test - Tailpipe Fail Only	--	--	--	--	--	--
Referee Test - All Vehicles	--	--	--	--	--	--
Referee Test - Pass Vehicles	--	--	--	--	--	--
Referee Test - Fail Vehicles	--	--	--	--	--	--
Referee Test - Underhood Fail Only	--	--	--	--	--	--
Referee Test - Tailpipe Fail Only	--	--	--	--	--	--

Repair Action Percentages

	Yes	No	Excd
MIS	--	--	--
IMG	--	--	--
A/F	--	--	--
CRK	--	--	--
EVP	--	--	--
EXH	--	--	--
EGR	--	--	--
ANY	--	--	--

Average Repair Costs

Parts Cost: $ -- Labor Cost: $ --

Observed Tampering Pattern

Visual Inspection Percentages

	PCV	TAC	AIR	FEC	FIL	OXC	3WC	EGR	ISC	CLP	CFI	OTH	ANY
Disc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mod	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Miss	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Totl	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pass	95.5	31.8	0.0	100.0	100.0	0.0	100.0	0.0	100.0	100.0	100.0	40.9	100.0
N/A	4.5	68.2	100.0	0.0	0.0	100.0	0.0	100.0	0.0	0.0	0.0	59.1	100.0

Functional Check Percentages

	EWL	IGT	EGR	ANY
Pass	100.0	68.2	0.0	100.0
Fail	0.0	0.0	0.0	0.0
N/A	0.0	31.8	100.0	100.0

Appendix B

1983 Model Year Certification Test Results

1983 50-STATE LDV'S

FORD

	ENG/FUEL	ECS	TRANS	HC	CO	NOx
*DFM1.6V2GDC7	1.6-2V	EGR/PMP/OXD/3WY	A-3	.33	3.6	.55
			A-3	.22	1.3	.56
DFM1.6V2GDK6	1.6-2V	EGR/PMP/OXD/3WY	A-3	.22	1.3	.56
			M-4	.36	1.5	.53
			M-4	.35	2.4	.48
			M-5	.22	1.6	1.0
DFM1.6V5HMCO	1.6-FI	EGR/PLS/OXD/3CL	A-3	.22	.78	.35
			M-5	.26	2.2	.32
			M-5	.28	2.1	.43
DFM2.3V1HPC2	140-1V	EGR/PMP/OXD/3CL	A-3	.18	1.6	.52
			M-4	.39	3.3	.56
			M-4	.38	2.9	.56
DFM2.3V5FDGX	140-FI	EGR/3CL	M-5	.16	1.6	.57
			M-5	.12	1.4	.55
DFM2.3V5FGT1	140-FI	EGR/3CL	M-5	.10	1.3	.50
			M-5	.12	1.8	.44
DFM3.3V1GEC3	200-1V	EGR/PMP/OXD/3WY	L-3	.36	2.4	.46
			L-3	.33	1.9	.59
DFM3.3V1GXC7	200-1V	EGR/PMP/OXD/3WY	L-3	.28	2.3	.69
DFM3.8V2GXC8	3.8-2V	EGR/PMP/OXD/3WY	L-3	.47	5.8	.59
			L-4	.28	4.4	.57
DFM5.0V4GMCO	302-4V	EGR/PMP/OXD/3WY	M-4	.36	2.4	.52
DFM5.0V5HLC5	302-FI	EGR/PMP/OXD/3CL	L-4	.39	1.9	.52
			L-4	.31	1.8	.68
			L-4	.30	1.8	.52
		AVERAGE		.28	2.2	.54

* EPA says all Fords are Pattern Failures.

1983 50-STATE LDV'S

GM

	ENG/FUEL	ECS	TRANS	HC	CO	NOx
*D1G1.6W2NEA5	1.6-2V	EGR/PMP/OXD/3CL	L-3	.23	.74	.52
			M-4	.25	.58	.51
D1G2.0W5XAJ9	2.0-FI	EGR/PLS/3CL	L-3	.13	3.2	.27
			M-4	.13	2.6	.56
D1G2.8W2NNA3	2.8-2V	EGR/PMP/OXD/3CL	L-3	.16	1.6	.59
			M-5	.27	3.0	.55
D1G5.0W4NDA7	5.0-4V	EGR/PMP/OXD/3CL	L-4	.21	3.9	.50
			M-5	.22	3.3	.49
D1G5.0W4NEA9	5.0-4V	EGR/PMP/OXD/3CL	L-3	.22	1.5	.56
			M-5	.30	3.0	.49
D1G5.0W4TMA1	5.0-4V	EGR/PMP/3CL	L-3	.32	5.6	.55
			L-4	.27	4.6	.16
D1G5.7W5NBM8	5.7-FI	EGR/PMP/OXD/3CL	L-4	.22	.95	.60
			L-4	.29	1.6	.54
D2G1.8V5TDGX	1.8-FI	EGR/3CL	L-3	.22	2.4	.47
			L-3	.23	2.8	.67
			M-5	.31	2.6	.47
			M-5	.34	2.3	.22
*D2G2.5V5TPG6	2.5-FI	EGR/3CL	L-3	.10	2.5	.30
			L-3	.11	1.6	.65
			M-5	.32	2.0	.27
D3G5.0W4ARA3	5.0-4V	EGR/PMP/OXD/3CL	L-4	.32	3.4	.48
			L-4	.27	3.1	.53
D4G3.8V8NBAX	3.8-4V	EGR/PMP/OXD/3CL	L-4	.30	2.7	.55
			L-4	.28	2.7	.93
D4G3.8W2TMA0	3.8-2V	EGR/PMP/3CL	L-3	.34	6.3	.45
			L-3	.32	5.5	.70
D4G4.1W4AEA3	4.1-4V	EGR/PMP/OXD/3CL	L-4	.43	2.9	.53
			L-4	.32	3.3	.66
			L-4	.33	2.8	.56
D6G4.1W5AGA9	4.1-FI	EGR/PMP/OXD/3CL	L-4	.28	3.3	.60
			L-4	.32	3.2	.61
		AVERAGE		.26	2.9	.52

* = Pattern Failure

1983 50-STATE LDV'S

NISSAN

	ENG/FUEL	ECS	TRANS	HC	CO	NOx
DNS1.5V5FAC9	1.5-FI	EGR/3CL	L-3	.16	2.5	.25
			M-5	.25	2.4	.23
*DNS1.6V9FAC9	1.6-2V	EGR/3CL	L-3	.22	3.4	.41
			M-5	.28	2.6	.29
*DNS2.0V2AAC4	2.0-2V	EGR/PLS/OXD	L-3	.26	2.7	.53
			M-5	.33	2.0	.51
DNS2.2V5FAA8	2.2-FI	EGR/3CL	L-3	.21	1.9	.37
			L-3	.25	2.4	.34
			M-5	.24	2.0	.49
*DNS2.8V5FAA0	2.4-FI	EGR/3CL	L-4	.34	2.4	.38
	2.4-FI		M-5	.30	2.4	.41
	2.8-FI		L-3	.29	2.3	.41
	2.8-FI		M-5	.35	4.2	.20
	2.8-FI		M-5	.27	2.3	.42
*DNS2.8V5FBC4	2.8-FI	EGR/3CL	A-3	.30	2.0	.48
			M-5	.31	2.4	.36
		AVERAGE		.27	2.5	.38

TOYOTA

	ENG/FUEL	ECS	TRANS	HC	CO	NOx
DTY1.3V5FBBX	79-FI	3CL	M-4	.15	1.9	.43
			M-4	.15	1.9	.40
DTY1.6V2FCC8	89-2V	EGR/PLS/3CL	M-5	.32	2.9	.23
	97-2V		M-5	.32	3.9	.24
DTY2.0V5FBB0	122-FI	EGR/3CL	L-4	.14	1.7	.22
			L-4	.14	1.7	.24
			L-4	.13	1.7	.22
			L-4	.12	0.9	.24
			M-5	.15	1.7	.21
DTY2.4V2EBB9	144-2V	EGR/PMP/3WY/CAI	M-5	.10	1.7	.17
DTY2.4V5FBB2	144-FI	EGR/3CL	A-4	.16	1.0	.59
			M-5	.18	2.2	.53
			M-5	.22	1.5	.51
DTY2.8V5FBB4	168-FI	EGR/3CL	L-4	.17	1.5	.32
			L-4	.16	1.4	.27
			L-4	.16	1.4	.29
			M-5	.16	1.9	.49
		AVERAGE		.17	1.8	.33

1983 50-STATE LDV'S

	ENG/FUEL	ECS	TRANS	HC	CO	NOx
HONDA						
*DHN1.3V3ABCO	81-3V	EGR/PLS/OXD	M-4	.27	1.8	.54
			M-5	.36	1.1	.70
			M-5	.36	1.3	.56
*DHN1.5V3ADC5	91-3V	EGR/PLS/OXD	A-3	.14	1.2	.64
			M-5	.23	2.4	.47
DHN1.8V0AHC8	112-3V	EGR/PLS/OXD	A-4	.23	2.8	.83
			M-5	.22	2.2	1.0
DHN1.8V3AFC5	107-3V	EGR/PLS/OXD	L-4	.25	2.1	.56
			M-5	.27	1.8	.62
		AVERAGE		.26	1.9	.66
SAAB						
DSA2.0V6FNT4	121-FI	3CL	A-3	.11	1.5	.22
			M-5	.14	1.6	.32
DSA2.0V6FTA9	121-FI	3CL	A-3	.19	2.0	.21
			M-5	.18	2.2	.42
		AVERAGE		.16	1.8	.29
VOLVO						
DVV130V6FCGX	130-FI	3CL	A-4	.16	2.6	.19
			M-5	.13	1.6	.31
DVV141V5FSN4	141-FI	3CL	A-4	.24	2.6	.10
			M-5	.29	2.2	.12
			M-5	.31	2.8	.17
DVV174V6FCG7	174-FI	3CL	A-4	.33	1.9	.22
		AVERAGE		.24	2.3	.19

LIST OF ABBREVIATIONS

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ARB	California Air Resources Board
AMA	Automobile Manufacturers' Association
°C	Degrees Centigrade
CARB	Carburettor
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRC	Coordinating Research Council
DB	Dual Bed
EPA	United States Environmental Protection Agency
°F	Degrees Farenheit
FTP	Federal Test Procedure
gm	Grams
gm/gal	Grams per Gallon
gm/mi	Grams per Mile
HC	Hydrocarbon
H_2S	Hydrogen Sulfide
I/M	Inspection and Maintenance
mg/gal	Milligrams per Gallon
mi/day	Miles per Day
MMT	Methylcyclopentadienyl Manganese Tricarbonyl
Mn	Manganese
M/P	Alkaline Metal/Phosphorus Ratio
MPFI	Multi-point Fuel Injection
MPG	Miles Per Gallon
MVMA	Motor Vehicle Manufacturers Association
NOx	Nitrogen Oxides
P	Phosphorus
Pb	Lead
PCV	Positive Crankcase Ventilation
Pd	Paladium
Pt	Platinum
Rh	Rhodium
RVP	Reid Vapor Pressure
S	Sulfur
SB	Single Bed
Si	Silicon
TBI	Throttle Body Fuel Injection
TWC	Three-Way Catalyst
VMT	Vehicle Miles Travelled
WOT	Wide Open Throttle
ZDP	Zinc Dialkyldithiophosphates
Zn	Zinc